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U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF ANIMAL INDUSTRY—BULLETIN NO. 40.

D. E. SALMON, D. V. M., Chief of Bureau.

DESCRIPTION AND TREATMENT

OF

SCABIES IN CATTLE.

BY

RICHARD W. HICKMAN, V. M. D.,
Chief of Miscellaneous Division, Bureau of Animal Industry.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1902.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., January 25, 1902.

SIR: I have the honor to transmit herewith a brief manuscript on the subject of Scabies in Cattle, by Dr. R. W. Hickman, chief of the miscellaneous division of this Bureau. Numerous requests for information have been received by this Bureau as to the character of this disease and the methods of treatment, and this paper has been prepared with a view to answering these inquiries. Accompanying the manuscript are specifications and drawings for making dipping vats, and also a list of lumber and hardware required.

Respectfully,

D. E. SALMON, *Chief of Bureau.*

HON. JAMES WILSON,
Secretary of Agriculture.

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SCABIES IN CATTLE.

PRELIMINARY STATEMENT.

Numerous letters are addressed to this Bureau making inquiry with regard to a disease called Texas itch. As this disease does not exist except to a very limited extent, if at all, in Texas, it seems strange that this name should be applied to it. Dr. M. Francis, of the Texas Experiment Station, says that the disease has never been observed among the cattle of that State. It is also known as range itch, cattle itch, and cattle mange, the last being the correct name, as it really is mange, or scabies. This disease has prevailed to a considerable extent among the range cattle of the West and Northwest, and has been heard of in other portions of the country also, and inquiries are constantly received for instructions in its treatment.

CAUSE OF SCABIES, OR MANGE.

Scabies, or mange, of the ox is a contagious disease caused by a parasitic mite. Cattle are affected with two varieties of these parasites, which belong to the class Arachnidæ. The *Psoroptes communis* var. *bovis*, is the one which most frequently affects them. It lives on the surface of the skin and gives rise to great irritation and itching by biting, and is most frequent upon the lateral aspect of the neck and shoulders, at the base of the horns, and the root of the tail. From these points it spreads to the back and sides, and may invade nearly the entire body. Its principal manifestations are more or less numerous pimples, exudation, and abundant scaling off, or desquamation, of the skin, falling out of the hair, and the formation of dry gray-brownish scabs. In the course of time the skin becomes thickened, stiff, wrinkled, and acquires the consistence of leather. When mange has spread over a large surface of the body, the animals lose flesh and become weak and anemic, rendering them constitutionally less able to withstand or combat the effects of the mites. At the same time the decreased vigor and lessened vitality of the affected animals favor the more rapid multiplication of the mites and the further extension and intensification of the disease. Thus we have cause and effect working together, with the result that scabies, or mange, in cattle may in some cases prove fatal; especially are fatal terminations liable to occur in the latter part of a severe winter among immature and growing animals, or those of adult and full age when in an unthrifty condition at the time of becoming infected. There have been noticed variations in the progress of the disease depending upon extreme seasons—aggravation in winter alternating with improvement in summer.

The mite which causes cattle itch, or mange, is closely related to the mite which causes sheep scab—both belonging to the same genus and species, but are different varieties. The sheep-scab mite will not attack cattle, nor will the cattle mite attack sheep or other animals. The itch mites are found to be very numerous upon affected cattle, and a very small quantity of débris from an actively infested area of the skin will often reveal a surprisingly large number of the parasites. These mites may be removed from an animal and retain their vitality for a long time. Specimens have been collected and kept in small glass bottles in the laboratory at the ordinary temperature of the room during the winter months varying from 45° F. during the night to 80° F. during the day, which would live and remain active from eight to eleven days. Exposure to bright sunlight, however, would kill most of the mites in a few hours.

Scabies does not appear to affect cattle while they are doing well on grass, nor attack those in good condition over three years old. The animals which suffer most are calves, yearlings, and two-year-olds, and those in poor condition. The first symptom of the disease is usually an intense itching of the skin about the neck or shoulders, and it extends more or less rapidly, depending largely upon the health and vigor of the animal, along the back and sides and down the outside of the legs, but does not usually affect the inside of the legs or the skin of the abdomen.

The other variety of this parasite which produces mange in cattle is the *Chorioptes symbiotes* var. *bovis*. This is known as symbiotic mange, or tail mange. It remains generally localized upon the depressions on the back part of the croup and at the base of the tail. It may, however, extend over the whole surface of the body if the treatment of the disease and care of the affected animals are neglected. These cases, however, are rare. Foot mange is also exceptional in cattle. Symbiotic mange has almost no spreading tendency, and its contagiousness is hardly noticeable. It yields readily to treatment and any remedy that will destroy the activity of the parasite producing the Psoroptic, or common, form of mange will readily kill that causing the symbiotic, or tail, mange. It is possible for the different morbid conditions produced by these two varieties of parasites (*Psoroptes communis* and *Chorioptes symbiotes*) to coexist.

FORM AND LIFE HISTORY.

The Psoroptes live upon the surface of the skin, adhere to it, and suck the blood and lymph of the skin by means of their mouth organs, producing a more or less intense inflammation through the numerous stings which they inflict. This species is characterized by its relatively greater size, its dimensions being 0.5 to 0.8 millimeter. Its general form is rounded or ovoid. It can be seen with the naked eye upon dark surfaces, and is very easily seen with the help of a magnifying glass. The head is elongated and pointed. The mandibles are long, straight, and stinging. The legs are very long. The sucking cups, tulip or trumpet shaped, are carried by articulated pedicles. In the male they are seen on the four pairs of legs; in the female, upon the first, second, and fourth pairs only. The Psoroptes in their immature form have three pairs of legs, while in the adult state they possess four. The latter with five joints are fitted with suction cups covered with fine hair and armed with claws or hooks. The head, thorax, and abdomen are not separated. The organs of mastication are represented by mandibles. The skin surface is covered with scales, hair, spikes, or silky hair, etc.

Females, which are larger than males, lay from 20 to 24 eggs; at the end of 4 to 7 days the larvæ come out, and after having undergone 3 or 4 metamorphoses, arrive at the stage of reproduction from the fourteenth to seventeenth day. If exposed to damp air, or placed upon wet manure, the mange parasites continue to live from 6 to 8 weeks. Upon damp ground the eggs remain alive from 2 to 4 weeks. In a dry place they lose their vitality after 4 to 6 days. Moderate heat is favorable to their vitality and to the hatching of the parasites.

In warm places under cover, and during the summer, their movements are more active and they multiply more rapidly than under the opposite condition. It has been estimated that one female alone may produce 1,500,000 individuals in 90 days.

Each animal species has its acari, or specific mange parasites; consequently, the expression "mange" must necessarily be incomplete unless the variety of the parasite is indicated. Thus of the Psoroptic acari, we have *Psoroptes communis equi*, which produces Psoroptic mange in the horse, *Psoroptes communis bovis* in the ox, and *Psoroptes communis ovis* in the sheep.

In each of these animals we also have the symbiotic mange, and in each the variety would be designated as in the case of the Psoroptic form; but in neither variety is the contagion transmitted from one species of animal to the other. The symbiotes live especially upon the surface of the skin of the extremities, and exist in epidermic scabs. They are from 0.3 to 0.5 of a millimeter in diameter. The outlines are visible to the naked eye or with the magnifying gl

The head is short, and wider than long. The body is slightly ovoid and notched upon the periphery. The legs are long and the sucking cups are shaped like a Roman shield, and are distributed in both the male and female, as in the case of the same organs on the legs of the Psoroptes.

Sarcoptic mange is a more serious disease than either of those already described, but is not common to cattle. It would not, therefore, seem important to refer to this form of mange parasite and occupy space in this bulletin except by a reference to the serious disease which is produced by the Sarcoptes through certain characteristics natural to them. We find Sarcoptic mange in the following domesticated animals—horse, sheep, goat, dog, cat, and pig.

The Sarcoptes dig subepidermic galleries and live on the plasma cells of the malpighian layer. They multiply in these galleries and occasion a very intense dermatitis, or inflammation of the skin. Because of the depth to which the Sarcoptes burrow, Sarcoptic mange is exceedingly hard to eradicate. It would, therefore, seem fortunate that this form of the disease is not common to cattle. It is rebellious to all medication, and very frequently recurrences of the disease produced by the Sarcoptes are seen in other species of animals after treatment which has been prolonged for months.

Concerning the transmissibility of the different manges to animals and man, we find that all Sarcoptes may live for an indefinite period upon man's skin, but the Psoroptes and Symbiotes die very rapidly and occasion but slight irritations. The horse may contract Sarcoptic mange of the sheep, pig, dog, and cat. The ox takes the Sarcoptes of the horse, sheep, goat, and cat. The sheep contracts Sarcoptic mange of the goat. The dog takes the Sarcoptes of man, pig, cat, sheep, and goat. The pig contracts Sarcoptic mange of the goat. From this it will be seen that Sarcoptic mange, unlike the Psoroptic and Symbiotic manges, is transmissible from one species of animal to another.

Mange is never developed except by contagion. The period of incubation—that is, the interval that lapses between the moment when the acari are deposited upon the surface of the body and the appearance of the disease on the skin—varies according to the number of parasites transmitted. When in small numbers, the first manifestations of mange are sometimes only seen at the end of 4 to 6 weeks, while at other times the disease may be clearly apparent at the end of 15 days. Contamination takes place either by direct contact—that is, immediate, as on pasture, at the stable, etc.—or by intermediary agents.

DISINFECTION.

What has already been said with regard to the contagious character of scabies in cattle—of the number of scab mites which may be found in a small quantity of the débris of the skin and their ability to live and remain active for a considerable length of time under unfavorable conditions—will indicate the importance of the thorough disinfection of corrals, sheds, or buildings in which affected cattle may have been kept. It is therefore necessary, in order to attain success in the treatment of this disease, to destroy parasites which have fallen off or have been dislodged from the animals as well as those that are upon them; otherwise there is danger of their becoming reinfected from the premises after the effects of the remedy applied to the animals have disappeared.

TREATMENT.

Methods in operation for the treatment of scabies in sheep have become more or less familiar to all people interested in sheep husbandry, and it may be said that the same treatment so successfully applied in ridding sheep of scabies has been found equally efficacious in the treatment of scabies in cattle.

In 1898 the Bureau of Animal Industry issued Bulletin No. 21, entitled "Sheep Scab: Its Nature and Treatment," which gives a description of this disease in sheep, its cause and treatment, with numerous formulas for the preparation of dips, and illustrations of the methods of applying them, together with directions for their use on both a large and small scale. The treatment of such large animals as cattle, which are difficult to handle, both because of their size and the conditions under which they live—the latter making them more or less intractable—would require a considerable amount of any preparation thoroughly to wet all parts of their bodies; next to effectiveness, therefore, small expense is the first object that must be considered. In the treatment of cattle for scabies, it seems fortunate that the dips of lime and sulphur, both of which are inexpensive, have proven effective and entirely satisfactory. During the past season thousands of cattle have been successfully treated for mange in the State of North Dakota, which work has been carefully investigated and observed by Dr. Robert H. Treacy, an inspector of this Bureau, who has furnished diagrams and photographs of the various plants, and who states that the dip which has been universally used in that section is that designated in Bulletin No. 21 as the No. 3 South African (Cape Town) official lime-and-sulphur dip (February 4, 1897), which is as follows:

Flowers of sulphur	pounds..	21
Unslaked lime	do....	16¾
Water	gallons..	100

Place the unslaked lime in a mortar box or some suitable vessel and add enough water to slake the lime and form a lime paste or lime putty. Sift into this lime paste the flowers of sulphur and stir the mixture well. Be sure to weigh both the lime and sulphur, and do not trust to measure them in a bucket or guess at the weight. Place the sulphur and lime paste in a kettle or boiler with about 25 or 30 gallons of boiling water, and boil the mixture for two hours at least, stirring the liquid and sediment. The boiling should be continued until the sulphur disappears, or almost disappears, from the surface. The solution is then of a chocolate, or liver, color. The longer the solution boils the more the sulphur is dissolved, and the less caustic the ooze becomes. Most writers advise boiling from thirty to forty minutes, but a much better ooze is obtained by boiling from two to three hours, adding water when necessary. Pour the mixture and sediment into a large tub or barrel, placed near the dipping vat, and provided with a bunghole about 4 inches from the bottom, and allow it ample time (from two to three hours or more if necessary) to settle. The use of some kind of a settling tank provided with a bunghole is an absolute necessity, unless the boiler is so arranged that it may be used for both boiling and settling. An ordinary kerosene oil barrel will answer very well as a small settling tank. To insert a spigot about 3 to 4 inches from the bottom is an easy matter. Draining off the liquid through a spigot has the great advantage over dipping it out in that less commotion occurs in the liquid, which therefore remains freer from sediment. When fully settled, draw off the clear liquid into the dipping vat and add enough warm water to make 100 gallons. The sediment in the barrel may then be mixed with water and used as a disinfectant, but under no circumstances should it be used for dipping purposes. A double precaution against allowing the sediment to enter the vat is to strain the liquid through ordinary bagging as it is drawn from the barrel or settling tank.

The above directions are for the quantity of dip given in the preceding formula. Any multiple of the constituents may be used, depending upon the capacity of the boiler, vessels, and tank to be filled, but, let it be repeated, that there should be no guessing about the proportions; that the directions for the preparation of the dip as here given should be closely followed, care being taken that boiling be continued for the full time recommended, and that the sediment is not used for dipping purposes.

In order to attain success in the treatment of mange, care and thoroughness of method must be observed. Animals that have been exposed should be dipped as well as those that show distinct evidences of the disease. After the lapse of a few weeks following the first dipping, the animals should be subjected to a second dipping, in order that parasites which may have survived the first treatment, or that may have gotten on the animals from corrals, sheds, buildings, or elsewhere, may be destroyed. Several thousand cattle were carefully examined by our inspector forty days after being put through the dip for the second time and he failed to find evidence of scabies on any of them. These animals commenced to improve soon after being subjected to the first dip, as the dip killed lice as well as the scab mites, and owners of cattle adjacent to the dipping plants have declared their intention to dip in future years to kill lice, even if scabies does not exist. The dip liquid in the tanks during the whole dipping process should be kept at a temperature of from 102° to 110° F. Each animal should be kept two minutes in the dip, and be put completely under twice during that time. All bad cases should be hand-rubbed and kept in the dip four minutes.

Pregnant cows have been treated, as well as cattle of all ages, from calves to full-grown steers, with the loss of but one animal in one of the swimming tanks. This was a steer which for some reason seemed to be unable to swim and was drowned. It would appear that the dipping of cows has no appreciable effect upon abortions, as a comparison with previous years showed that the dipping had not increased the average number of abortions regularly occurring among these herds before dips were used.

DIPPING PLANTS.

Of the various dipping plants in use, there are but two kinds that need description—the small dipping plant, which is inexpensive and suitable for use by a community of farmers, and the larger dipping plant with swimming tank, such as would be needed if large numbers of range cattle are to be treated. A suitable plant for a community of farmers has been built for $150, while a swimming tank will cost $350.

Such a plant as that in operation 18 miles north of Steele, N. Dak., known as the Langedahl, would seem to be an admirable example of the smaller kind. This plant, with the exception of the tank, was built by farmers. A thrashing engine was used for heating purposes by connecting a 1¼-inch pipe to the whistle intake, the whistle being removed, and the pipe joined to the union. The plant has a capacity of 200 head per day. Its cost, without engine or labor, excepting the labor to build the tank or vat, was $150. One person can easily lower the cage when loaded by taking a hitch around a post, and it may be raised, as shown in illustrations, either with engine or horses. (See frontispiece.)

Following are the drawings and list of materials for the smaller plant, the tank of which may be filled with dip made as per preceding formula for about $7.50. Drawings and list of materials were furnished by Dr. Robert H. Treacy.

LIST OF MATERIALS.

Entrance pen and chute.

65 plank 2 inches x 6 inches x 16 feet.
28 posts.
18 braces 4 4 4 .

Tank, or vat.

800 feet good 2-inch plank.
400 running feet tongue strip.
10 pieces 4 inches x 4 inches x 16 feet.
2 pieces 2 6 16 .
10 pounds lead.

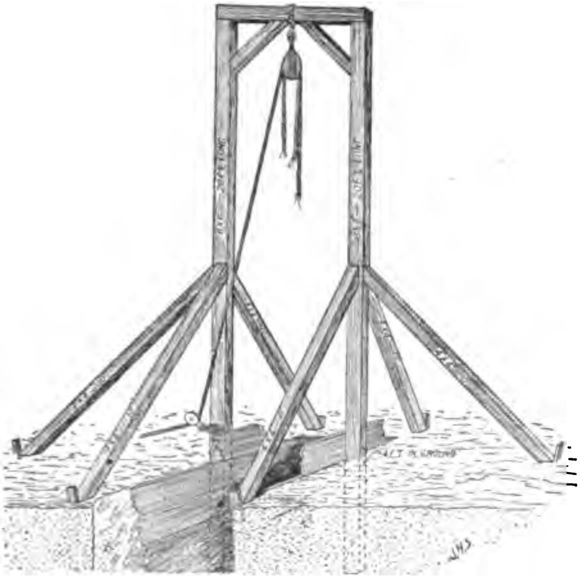

FIG. 1.—Derrick. Sixteen ft. high above ground. Derrick posts 4 ft. in ground, 6 by 6 by 20 ft. long. Braces 4 by 4 by 10 ft. long; 2 double-leaf 6-in. blocks at top of derrick, and 1-leaf 5-in. pulley at bottom of derrick; 100 ft. of 1-in. rope.

Cage.

8 pieces 4 inches x 4 inches x 16 feet.
8 pieces 2 4 16 .
12 pieces 2 10 16 .
10 pieces 1 10 16 .
4 half-inch iron rods, with ring in each end, 5½ feet long.
2 half-inch iron rods, with ring in each end, 4 feet long.
3 pair of heavy hinges.

Derrick.

2 pieces 6 inches x 6 inches x 20 feet.
1 piece 6 6 10 .
6 pieces 4 4 12 .

Drip chute.

10 pieces 2 inches x 6 inches x 14 feet.
4 pieces 2 12 14 .
4 pieces 4 4 16 .
1 pair heavy hinges.
1 gallon tar.

Holding pen.

132 cedar or oak posts.
200 pounds wire.
5 pounds staples.

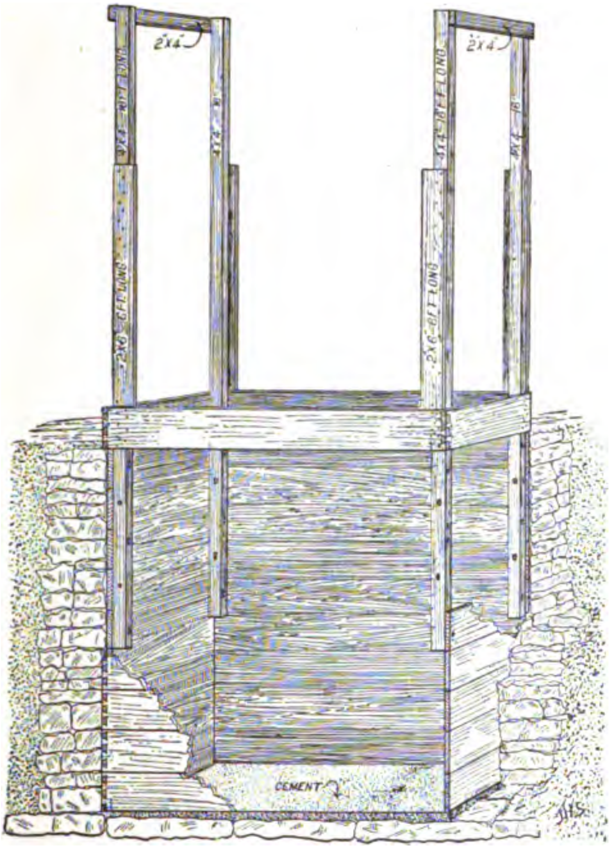

Fig. 2.—Vat. Tank 10 ft. deep, 4 ft. wide, 9 ft. in ground. Should contain from 5½ to 6 ft. of dip. Standards 4 by 4 by 16 ft. long, bolted to tank inside, to extend 6 ft. inside of tank, to act as guides to cage; 2 by 6 in. plank 6 ft. long nailed to outside of standards; 2 by 4 or 2 by 6 in. braces across top of standards. The tank should be built of 2-in. plank and joined with a tongue, the ends of the tank mortised in, the joints coated with lead. The braces are 4 by 4. The tank, being placed in the ground and packed solid, does not require much bracing. The tank should be laid in cement bottom, with stone and mortar about sides.

Hardware and incidentals.

100 pounds 20-penny spikes.
20 pounds 40-penny spikes.
2 6-inch double-leaf blocks.
1 5-inch single-leaf block.
100 feet 1-inch rope.
25 feet 1½-inch iron pipe.
1 galvanized-iron heating tank (5 barrels capacity).
4 oil barrels.

A plant of this capacity will answer very well in a community where various owners have bunches of cattle ranging from 80 to 100 head or less. Among its chief advantages over the swimming tank are cheapness in construction, because of its size, and proportionately smaller expense in operating; the dip can be kept at the required temperature with facility, because of its lesser volume, and the submerging of the animals, as well as the length of time it is desired to keep them in the dip, can be more easily regulated.

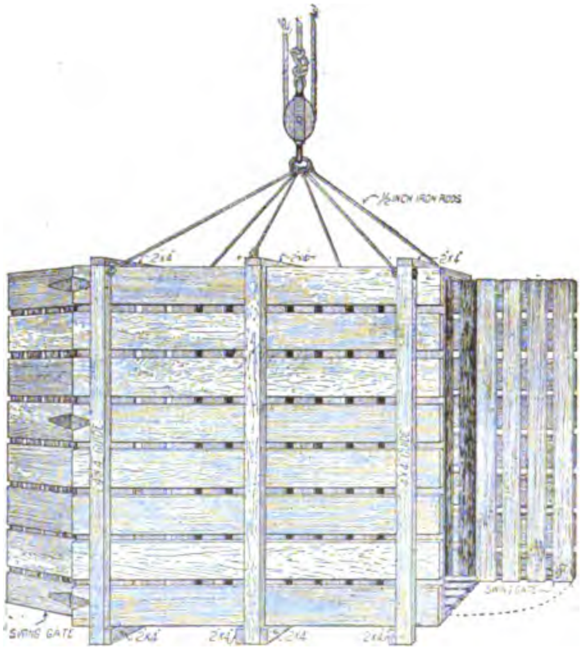

Fig. 3.—Cage. Eight ft. long, 8 ft. high, 2½ ft. wide—inside measurement; 2-in. plank used for outside boarded up and down inside with 1-in. boards to keep animals from climbing up sides. Plank 2 in. apart. Inside boards 2 in. apart, and 1-in. cracks in floor to allow free escape of dip fluid.

In communities where mange does not exist and where numbers of small herds are infested with lice, a plant of this character might be constructed and used with profit to the cattlemen. Many of the cattle that were dipped during the past year because of having been exposed to mange, or scabies, by being herded with those affected, showed much improvement in condition soon after dipping, as they were infested with lice to a considerable extent, although showing no distinct evidence of being affected with mange. It was observed that the lousy and mangy cattle stopped rubbing or digging after the first dip, and improved rapidly after being relieved of the torture that is inflicted by both of these troublesome parasites—scab mites and lice.

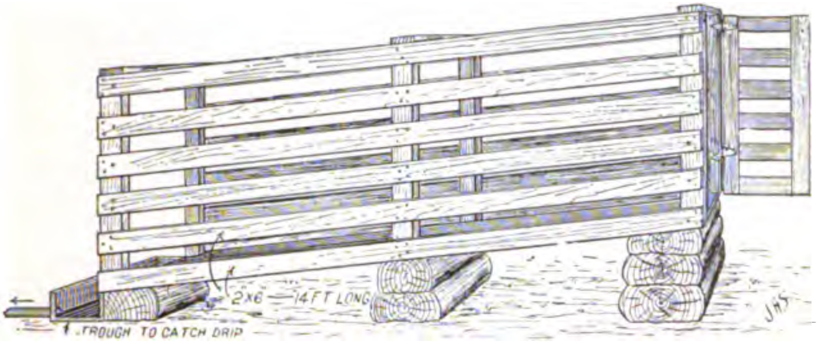

Fig. 4.—Drip chute. Fourteen ft. long; 2 by 6 in. plank; 5 ft. high. Set with 18-in. slope from front to rear. Trough at rear to catch drip, trom which a pipe may be run to connect with tank to carry drip from drip chute back into tank. Floor of drip chute should be tight to prevent waste.

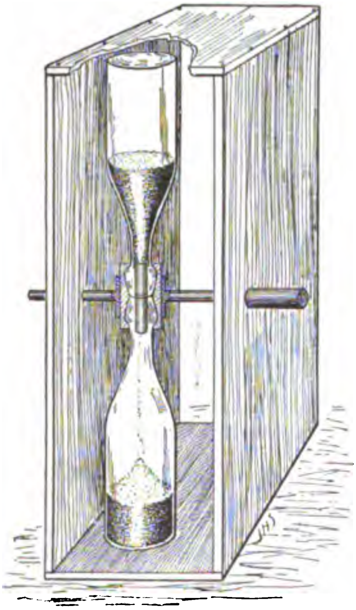

Fig. 5.—Sand glass. For timing the animals in the dip. Is made of two ordinary ketchup bottles connected by a hollow wooden cork, placed in a box, and the box hung on a pin through the center to revolve, as shown in the illustration.

SPECIFICATIONS FOR LARGE DIPPING PLANT WITH SWIMMING TANK.

The following plans and specifications are for the construction of such a dipping plant as that of the Rice Lake Cattle Company, which is located 12 miles north of Sterling, N. Dak., and are in accordance with the drawings made for that company after the following specifications:

SPECIFICATIONS.

Specifications of labor and materials required in the construction of a cattle dipping plant to be built at — — ——— for ——— ———, in accordance with drawings made for the same by A. Van Horn, of Bismarck, N. Dak.

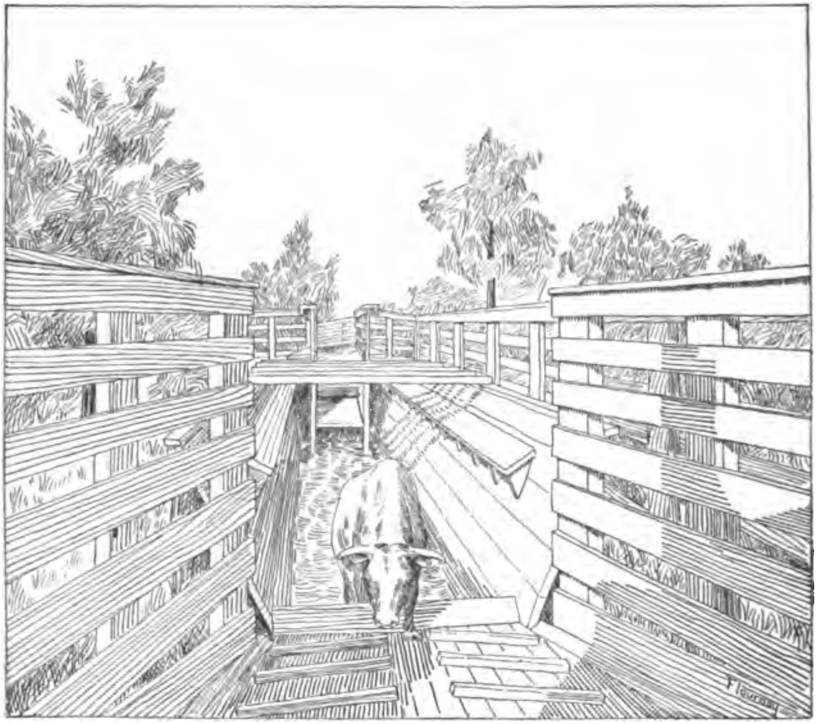

FIG. 6.—Steer emerging from dipping vat, or swimming tank of large plant.

Excavations.—Excavate for the vat, as shown by the drawings, to the proper depth; level the bottom of the pit for the sills of the vat. After the vat is completed and the outside has been coated with coal tar, fill in around the vat, using the surplus earth to bank up and grade the sides of the vat above the natural grade, sloping the banks from the vat. Dig all holes required for the gate and fence posts.

Carpenter work.—All work must be done in a skillful and workmanlike manner; the framework of the vat to be bolted and spiked together; the plank of sides, ends, and bottom of the vat and dripping floor to have edges beveled for the calking as per detail, well driven together and well spiked with 20d. wire nails, using 40d. nails on the 3-inch plank. Calk all seams with oakum, well driven in with a calking iron and pitched. The exit, or inclined end, of the vat to have 3-inch bottom plank; all other plank of the vat and dripping floor to be 2 inches thick. Top of vat to be tied with 4 x 4 inch ties across top, framed and bolted to uprights as shown. Put 2 x 12 inch splash boards on sides at top of vat, nailed to under side of tie timbers and braced. The exit end of vat and dripping floor to be cleated with 1½ x 3 inch stripe, well nailed to floor and bottom. Construct the trap at entrance—30 x 84 inches—of

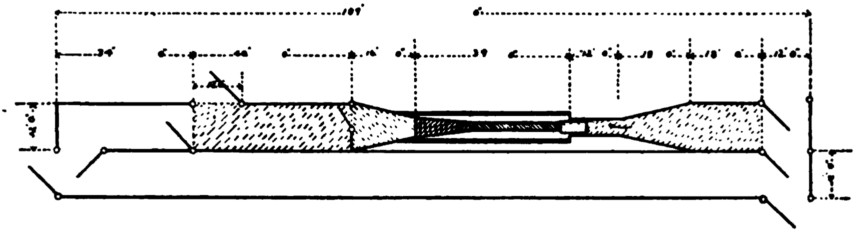

FIG. 7.—Plan of dipping plant, viewed from above.

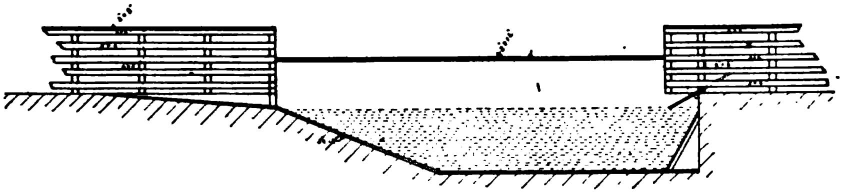

FIG. 8.—Vertical section of dipping vat, with older-style automatic trap on pivot. It will be seen that the incline at the bottom of the trap end of the vat is in a perpendicular line with the free end of the trap; where the spring trap is used, the length of the incline should be increased in order that at the bottom of the vat it may still be in line perpendicularly with the end of the trap when set; otherwise cattle are liable to get back under the trap, causing trouble.

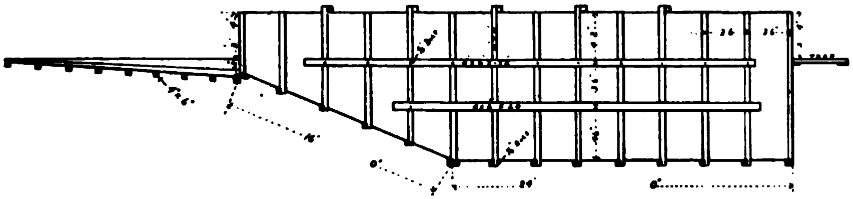

FIG. 9.—Side view of dipping vat, showing inclined egress and dripping floor.

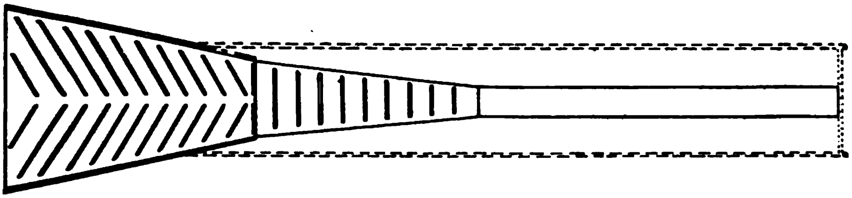

FIG. 10.—Swimming tank with incline and drip chute, looking from above.

2-inch plank, with 2 x 10 inch battens bolted together, top to be covered with 14-gauge sheet steel. Trap to swing on a 2-inch wrought-iron pipe or 2-inch steel bar seated in the end of vat, with ½ x 4 x 12 inch iron sockets bolted to vat. Secure the trap to the axle with iron straps bolted to under side of the center battens. End of vat to have false back as shown.

Gates and fence.—Construct and erect the gates and fence as per drawings. The gate post to be set 4 feet in the ground and the fence posts 3 feet 6 inches. Set all posts plumb and to a line; well and thoroughly tamp the earth around the posts. The bottom of all posts to be coated with coal tar before being set. Gate posts to be 8 x 8 inches, with 6 x 8 inch tie framed and driftbolted to the posts. Fence posts to be 6 x 6 inches. The gates to be bolted and spiked together and braced as shown. To be hung with ½ x 3 x 36 inch strap eye-and-bolt hinges. Bolt to run through posts and hinges bolted to gates. Gates to have ½ x 3 x 16 inch iron hasp bolted to gates and a suitable bolt staple, with iron pin and chain for locking.

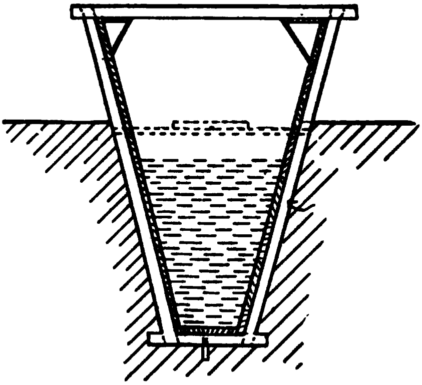

FIG. 11.—Vertical section of swimming vat, showing end of trap.

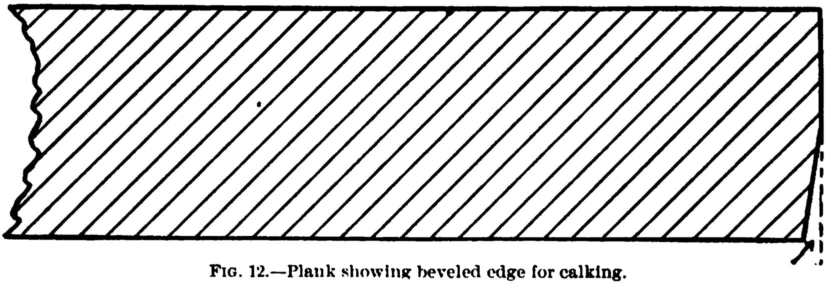

FIG. 12.—Plank showing beveled edge for calking.

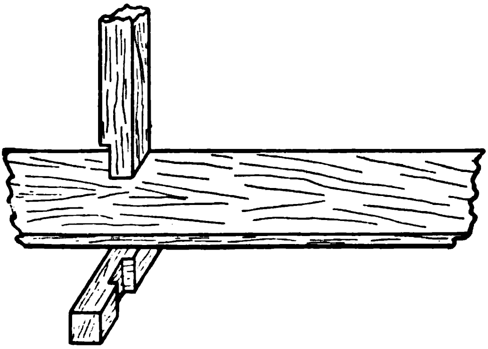

FIG. 13.—Sill and upright, showing method of joining.

Fence.—The fences to be five-railed, with cap, ribbon fence. Rails, or ribbons, to be of 2 x 6 inches, with 2 x 8 inch cap, spiked at each bearing with two 40d. wire nails. Posts to be set 8 feet on centers, or nearer where distance may require.

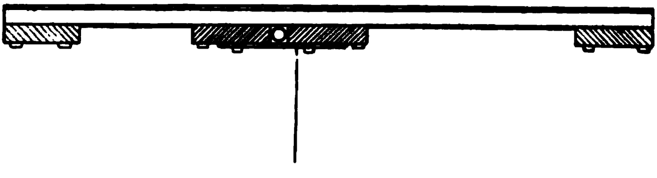

FIG. 14.—Vertical section of an older style of automatic trap, showing 2-in. iron pipe upon which trap is pivoted.

Lumber.—All lumber to be to No. 1 pine or fir dimension, free from shakes, bark, large pitch pockets, unsound knots, or other imperfections that materially impair its strength, durability, and use for which it is intended.

Drainage.—The vat to have a 2-inch waste pipe fitted in the bottom with gate valve and elbow, and 20 feet of pipe to run horizontally under ground, with a fall of 2 feet on 16 feet. At this point the owner will take up the drainage without cost to the contractor, and continue the same to a suitable point either by pipe or open ditch.

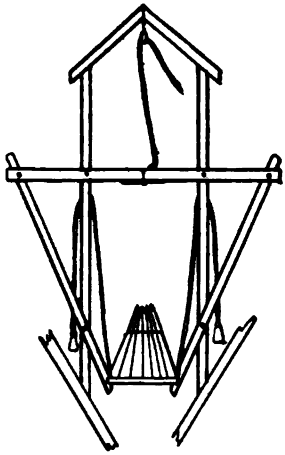

FIG. 15.—Spring trap set.

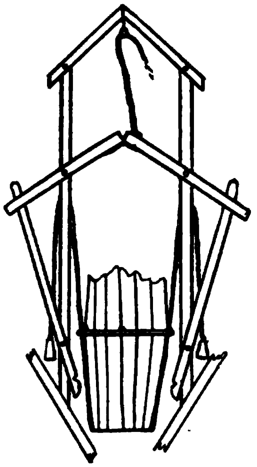

FIG. 16.—Spring trap sprung. This trap is hung on an iron rod or on a 2-in. iron pipe; weights are attached at the free end to pull it back in place; it then sets automatically.

Dimensions of vat.—Perpendicular depth of vat to be 10 feet; width at top, 7 feet; width at bottom, 2 feet; length of level bottom, 24 feet; horizontal length of sloping bottom, 15 feet; width of dripping floor at upper end, 12 feet; at lower end, 5 feet.

Floor of pens.—Should the owner decide to floor the catch pen and holding pen No. 1, the floor will be of 2-inch plank nailed to 4 x 4 inch joist or sleepers let into the ground and leveled. The sleeper to receive one coat of coal tar before being laid.

LUMBER BILL.

Vat and dripping floor.

Plank for sides, ends	1,080 feet	= 30 pcs.	2″	x 12″	x 18′	No. 1 pine or fir.
False back and bottom	576	24	2	12	12	"
	64	2	2	12	16	"
	96	2	2	12	24	"
		or 3			16	"
	240	5	3	12	16	"
	72	2	3	12	12	"

Sills, uprights, and ties	24 feet =	1 pc.	4″ x	4″ x	18′	No. 1 pine or fir.
	37	2 pcs.	4	4	14	"
	64	3	4	4	16	"
	32	2	4	4	12	"
	27	2	4	4	10	"
	64	2	4	6	16	"
	336	21	4	4	12	"
	96	4	4	4	18	"
	21	1	4	4	16	"
	19	1	4	4	14	"
Splash boards	160	4	2	12	20	"
Cleats	54	9	1½	3	16	"
Trap	23	1	2	10	14	"
	30	1	2	10	18	"
Total	3,115 feet.					

Gates.

Posts	896 feet =	14 pcs.	8″ x	8″ x	12′	No. 1 pine or fir.
Tie beams	448	8	6	8	14	"
Ribbons	480	40	2	6	12	"
Braces	144	8	2	6	18	"
Battens or rails	96	6	2	6	12	"
	128	4	4	6	16	"
Total	2,192 feet.					

Fence.

Posts	2,010 feet =	67 pcs.	6″ x	6″ x	10′	No. 1 pine or fir.
Ribbons	240	20	2	6	12	"
	140	10	2	6	14	"
	1,760	110	2	6	16	"
	450	25	2	6	18	"
Caps	64	4	2	8	12	"
	32	2	2	8	14	"
	469	22	2	8	16	"
	120	6	2	8	18	"
Total	5,285 feet.					

NOTE.—Oak or cedar posts are to be preferred. If round cedar posts are used, substitute 10-inch round posts for the 8 x 8 inch and 8-inch round posts for the 6 x 6 inch posts as above.

For catch pen.

There should be a plank floor in the catch and holding pen No. 1, but if only a limited number of cattle are to be dipped this may be omitted.

If it is decided to floor these pens the following material should be added to the foregoing lumber bill:

For holding pen No. 1	240 feet = 15 pcs. 4″ x 4″ x 12′ No. 1 pine or fir.
	850 " 2″ pine or fir plank, 12″ x 18′.
	240 " = 15 pcs. 4″ x 4″ x 12′, No. 1 pine or fir.
	960 " 2″ plank 16′.
Total	2,290 feet of additional lumber.

Cottonwood lumber may be used where the market price of same would make it practical.

SCHEDULE OF HARDWARE, ETC.

Vat and dripping floor.

42 carriage bolts, ½″ x 6″, with washers.
40 “ ½ 8 “
18 “ ½ 4 “
40 lbs. 20d. common wire steel nails.
10 “ 30 “ “
15 “ 50 “ “
1 sheet No. 14 sheet steel, 30″ x 84″, with 1 gross 1″ No. 10 screws.
20 lbs. oakum.
40 “ pitch.
10 gals. coal tar.
5 feet 2″ pipe or steel bar, for trap.
21 “ 2″ wrought-iron pipe, with couplings.
1 elbow, 2″.
1 flange for securing pipe to bottom of tank, 2″.
1 gate valve, 2″.

Gate and fence.

8 pairs eye-and-bolt hinges, heavy, ½″ x 3″ x 36″.
8 hasps, ½″ x 16″ x 3″, with bolt staple, for 8″ posts.
48 bolts, ½″ x 3″.
20 “ ½ 4½
68 “ ½ 6
160 “ ½ 4
32 driftbolts, ½″ x 12″.
20 lbs. 30d. common wire nails.
65 “ 40 “ “ “
16 gal. coal tar.

NOTE.—If catch and holding pen No. 1 is to be floored, add to the above 30 lbs. of 30d. wire nails and 5 gallons coal tar.

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U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF ANIMAL INDUSTRY—BULLETIN No. 41.

D. E. SALMON, D. V. M., Chief of Bureau.

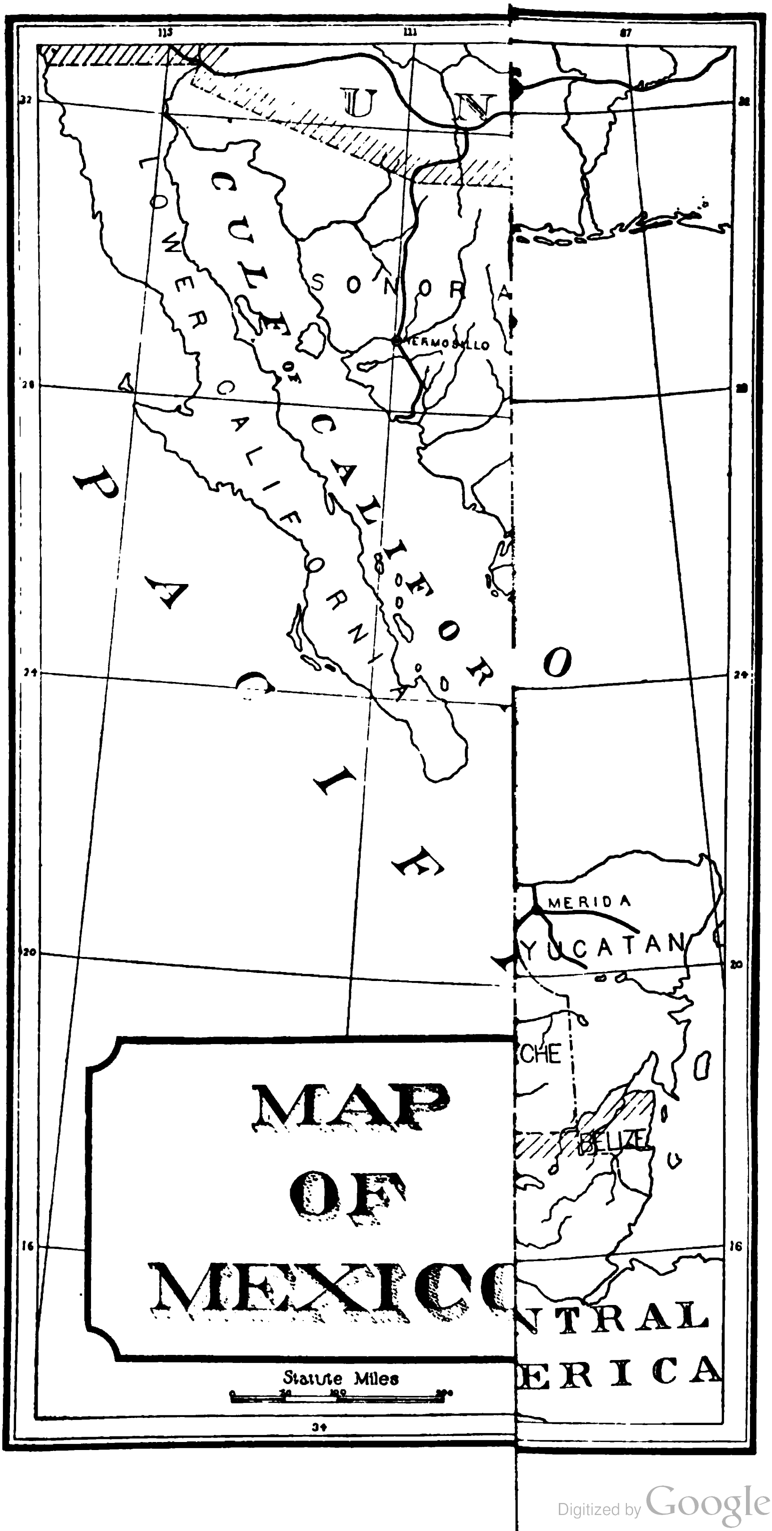
MEXICO AS A MARKET
FOR
# PUREBRED BEEF CATTLE
FROM THE
UNITED STATES.

BY

D. E. SALMON, D. V. M.,

Chief of Bureau of Animal Industry.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1902.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LETTER OF TRANSMITTAL

U. S. Department of Agriculture,
Bureau of Animal Industry,
Washington, D. C., January 31, 1902.

Sir: I have the honor to transmit herewith some data relative to the importation of cattle into the Republic of Mexico, which will probably be helpful to those breeders of purebred cattle in the United States who may be inclined to avail themselves of the advantages which are now offered in that country. I recommend the publication of this matter as Bulletin No. 41 of the Bureau of Animal Industry.

Respectfully,

D. E. Salmon,
Chief of Bureau.

Hon. James Wilson,
Secretary of Agriculture.

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Map of Mexico .... Frontispiece

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MEXICO AS A MARKET FOR PUREBRED BEEF CATTLE.

PRELIMINARY STATEMENT.

The purpose of publishing the information contained in this bulletin is to assist those who raise purebred cattle to find a market for their surplus animals. A careful perusal of the letters from the United States consular officers in Mexico shows very clearly that there is a great demand in Mexico for bulls of our beef breeds for improving the size and quality of the small Mexican cattle. There are already many of them being used for this purpose in that country. The letters also point out some of the principal drawbacks which exporters of cattle to that country encounter, but at the same time the opportunities afforded are fully set forth.

The largest cattle ranches of Mexico are in the northern States—those bordering the United States, such as Sonora, Chihuahua, and Coahuila—but cattle raising is an industry of no mean proportions in many other of the States of the Republic. These ranches are there called haciendas, and many of them contain many hundreds of square miles. It is not uncommon to find upon them as many as 20,000 head of cattle. It is stated upon good authority that one wealthy Mexican brands from 30,000 to 40,000 calves annually on his haciendas.

The following information concerning the cattle industry of Mexico is taken from Bulletin No. 9 of the Bureau of American Republics, issued July, 1891:

> One of the most important of Mexico's industries is cattle raising. The States of the northern frontier are so well adapted to such purposes that they may be said to be immense cattle ranges. The excellent situation of the lands as well as their generally well-watered condition will, as has been said by persons who have given study to the matter, make Mexico a formidable rival of the Argentine Republic. Lately, Texan and English capitalists have made extensive purchases of lands and live stock in the northern States, and are devoting themselves to the lucrative business of raising cattle for the market. But it is not only in the temperate and cold lands of the northern States that this industry may be carried on. In the warmer latitudes, where the herbaceous vegetation is exuberant and water courses abundant, it offers equal opportunity for success.
>
> The fattening of beeves on ranges well-conditioned for grazing, or which lend themselves to grass growing and are well watered, give excellent results.
>
> * * * * * * *
>
> The States of Durango, Sonora, Chihuahua, Nuevo Leon, Coahuila, Tamaulipas, Vera Cruz, and Michoacan present admirable fields for the carrying on of this

great industry. The rich pasture lands of the latter State feed the thousands of cattle slaughtered for the sustenance of the residents of the capital of the Mexican Republic, which is by no means an inconsiderable number, for during the year 1888 there were 83,228 beeves and 130,263 sheep slaughtered in the abattoirs of the city of Mexico. Some of the States above named are not well provided with water, but it has been demonstrated that with small expense all the necessary water can be provided by the boring of wells. In the State of Guanajuato a company, under the patronage of the State government, has bored wells and begun the breeding and fattening of cattle on a large scale. This company has imported into the country a considerable number of specimens of the best breeds of horned cattle from the United States and elsewhere, and judging from appearances its efforts are meeting with gratifying success.

Mexico raises great numbers of cattle for the United States, and does so under better conditions of climate than the latter country, for the stock raisers of this country lose thousands every year owing to the rigorous winter and severe summers, while in Mexico perennial spring smiles on man and beast.

Statistics show that in 1883, in the northern States of Mexico alone, over an area of 300,000 square miles there roamed 1,500,000 horned cattle, 2,500,000 goats, 1,000,000 sheep, 1,000,000 horses, and 500,000 mules. During the same year there were 20,574 cattle ranches in the country, valued at $515,000,000, which number and value have increased considerably in the last seven years.

MEXICANS SEEKING A MARKET.

Previous to the passage of our tariff act of July 24, 1897, a large part of the surplus cattle from the haciendas of these bordering States found a market in the United States whence they were taken for pasturage in dry seasons and for feeding. The number thus brought over the border was sometimes as great as 400,000 annually. The tariff then was 20 per cent ad valorem, but since 1897 it has been $3.75 per head for animals valued at $14 or less, and the annual importations have fallen to about 100,000.

Thus was created a situation which alarmed the Mexican cattle raisers, who found their surplus of several hundred thousand cattle thrown back upon them, and they were under the necessity of finding other markets. In seeking such markets they have discovered that, in order to meet competition, they must produce an animal that is worth shipping, and one that will sell when it is shipped. In other words, they must be able to ship animals which are much larger than the native stock, and which carry a large percentage of the blood of the well-known beef breeds. The Mexicans are now looking to England as an outlet for their cattle, and their purpose in importing our pure-bred bulls is to build up their native herds so that the product will sell well abroad.

OUR EXPORTS TO MEXICO.

Our exports of cattle to Mexico, which are probably all breeding animals, have been increasing recently. A table is compiled, which shows the number and value, as well as the average price per head of the cattle exported to Mexico during the years 1893 to 1900, inclusive. These figures are taken from the monthly reports of the Bureau of Statistics of the Treasury Department. For use in making comparisons and for general interest the number and value of the sheep, hogs, and horses exported to Mexico are also given. The table follows:

Number and value of cattle, sheep, hogs, and horses exported to Mexico, 1893 to 1900, inclusive.

Year.	Cattle.			Sheep.		Hogs.		Horses.	
	Number.	Value.	Average value.	Number.	Value.	Number.	Value.	Number.	Value.
1893	663	$38,367	$57.86	1,261	$4,417	977	$34,670	----------	----------
1894	2,150	35,331	16.31	5,538	8,648	1,305	16,555	----------	----------
1895	887	34,593	39.00	1,768	8,047	8,105	97,675	----------	----------
1896	861	28,441	33.03	5,373	14,121	28,848	345,056	1,198	$73,074
1897	701	36,854	52.57	2,077	8,275	9,494	107,646	1,318	70,672
1898	2,500	94,404	37.76	3,179	12,205	3,305	38,014	1,733	99,360
1899	3,236	138,223	42.70	2,514	11,112	8,104	107,341	1,414	98,065
1900	3,201	140,119	43.77	3,509	13,503	2,095	24,534	994	96,780

POOR CATTLE IMPOSED ON MEXICANS.

It is stated above that probably all of these cattle which go from the United States into Mexico are breeding stock. The average price being so low lends color to the oft-repeated charge that most of the cattle which have so far found a market in Mexico have been of very inferior stock. It can hardly be doubted, after reading the statements of our consular officers, that the Mexicans have been grossly deceived by dealers in American cattle. It is pleasant to be informed by Consul-General Barlow, at Mexico, that "of cattle purchased from Americans in the United States there has not been, to my knowledge, a single complaint." This is what Mr. Barlow says concerning the imposition referred to above:

> It must be admitted that at present Swiss cattle are rather more in favor among the native stock raisers than American cattle, not from any lack of merit of really purebred cattle, but because certain unscrupulous dealers have imposed inferior cattle upon native cattle raisers and breeders under the representation that they were purebred American cattle. The deception is, of course, found out sooner or later and reflects in no small degree upon American cattle, or, rather, upon American cattle dealers in general. Of cattle purchased from Americans in the United States, there has not been, to my knowledge, a single complaint. Such cattle have always proved entirely satisfactory.

Various methods to prevent the shipment to Mexico of cattle not registered have been suggested. One consul calls attention to the practice of the Swiss Government of inspecting all cattle exported from that country and issuing certificates of the pedigreed animals. He says the result is that no spurious Swiss cattle have entered Mexico. While this method might be impracticable for the United States Government, it might be practicable for the breeders themselves to organize for the purpose of giving a guaranty with the animals they sell. Such an organization should be so thoroughly representative as to command the respect of the cattle raisers of Mexico.

EXORBITANT PRICES ARE DETRIMENTAL.

There is a general complaint coming up from Mexico that the prices of our cattle are too high. On this point Hon. Leandro Fernandez, Secretary of Fomento (agriculture), says:

> I believe that to promote the importation into this country of fine-blooded cattle from the United States it will be necessary for the cattle raisers of the United States to reduce their prices, for the real obstruction to the importation of American cattle is to be found in the high—I might say almost prohibitive—prices.

The average prices which have been received for our cattle for several years in Mexico do not indicate that too much was asked for good purebred animals. However, the prices asked may have been altogether too high for the kind of cattle offered, since we are informed that so many inferior animals have been imposed upon the Mexicans as purebred. The fair prices asked by the honest breeders of the United States would probably not appear exorbitant to the Mexicans if they knew how greatly superior such animals are to those which have been sold down there as purebreds. The Mexicans will not forget that the object they have in view in improving their herds is to produce a class of animals which will sell in England, and it ought not to be difficult to convince them that the best means to attain this end is by the employment of the very best breeding animals to be had. It was by such methods that the United States reached its present high position with reference to purebred cattle; and Mexico, too, will learn that there is no other method which will lead to preferment.

The breeders of purebred cattle in the United States are not producing a surplus so large that it becomes necessary to sell them at greatly reduced prices. They have a fairly good market at home. The possibilities of increasing the number of breeding animals in this country are great, and the breeders are ready to take up the work whenever they can see that it is likely to prove profitable.

It is quite evident, however, if we may judge by the experiences of men in providing markets for other products, that concessions must be made; that those who have cattle to sell must do something toward creating a market. It would be a far-seeing policy for our breeders to do their utmost to create, not only in Mexico, but in the South American countries also, a market for those classes of breeding animals which we can best produce. When once such a market is created our breeders could bend their energies toward increased production in order to supply the demand which they have created. Therefore it has been suggested that it may be the best plan for our breeders to reduce the prices of animals for export to Mexico until such time as the Mexicans may become convinced that the cattle sent them are all that is claimed for them and that such cattle are indispensable to the success of the object which they have in view.

PRICES OF PUREBRED CATTLE.

The impression appears to prevail to some extent in Mexico that the prices which are asked by the breeders of purebred cattle in the United States are altogether too high, and some of them have the impression that the prices quoted to Mexican buyers are much higher than the animals would bring if sold in the United States. The best answers to such objections may be found in the reports of actual sales made at different points in this country. Below is given some statistics of sales of the different breeds of purebred cattle, which were compiled by Col. F. M. Woods and published in the Breeders' Gazette for December, 1901:

Table showing average prices of purebred beef cattle in 1901.

SHORTHORNS.

Date of sale.	Place of sale.	Number sold.	Total.	Average price.
January 16	West Liberty, Iowa	42	$3,537	$84.20
January 17–18	Kansas City	132	12,615	95.57
February 8	Indianapolis	56	7,825	132.15
February 6	Kansas City	59	5,916	100.00
February 12–13	Chicago, Ill	82	15,445	188.35
February 13	Fort Worth, Tex	44	7,645	173.75
February 13	Fort Worth, Tex	2	410	205.00
February 13	Fort Worth, Tex	7	1,652	236.00
February 21	Kansas City	58	6,860	118.30
March 6–7	Kansas City	40	13,845	346.12
March 6–7	Kansas City	20	7,535	376.75
March 6–7	Kansas City	40	7,705	192.62
March 12–13	South Omaha	81	36,845	454.85
March 14–15	West Liberty, Iowa	90	25,755	286.16
March 22	Newton, Iowa	62	13,465	217.20
March 26	Minneapolis, Minn	45	14,780	328.45
March 29	Kansas City	34	9,930	292.00
March 29	Kansas City	12	1,535	127.90
March 29	Kansas City	3	465	155.00
March 28	Mount Sterling, Ill	36	9,665	268.50
March 27	Eden, Ill	41	9,430	230.00
April 3–4	Macomb, Ill	66	7,560	114.55
April 5	Chicago	5	6,080	1,216.00
April 5	Chicago	10	6,835	683.50
April 5	Chicago	15	9,200	613.33
April 5	Chicago	9	7,025	780.55
April 5	Chicago	7	3,940	562.85
April 9	Webster City, Iowa	51	14,065	275.80
April 10	Rolfe, Iowa	50	27,205	544.10
April 11	Victor, Iowa	43	13,630	317.00
April 12	Victor, Iowa	51	27,370	536.65
April 12	Victor, Iowa	5	840	168.00
April 8	Marshalltown, Iowa	21	3,570	170.00
April 17	Sutherland, Iowa	27	8,215	304.25
April 15	Newton, Iowa	33	5,195	157.40
April 17	Indianapolis	54	8,200	152.00
April 22–23	Kansas City	97	21,015	216.65
April 24	Capron, Iowa	52	19,185	368.95

Table showing average prices of purebred beef cattle in 1901—Continued.

SHORTHORNS—Continued.

Date of sale.	Place of sale.	Number sold.	Total.	Average price.
April 25	Collins, Iowa	43	$12,180	$283.25
April 26	Crawfordsville, Iowa	48	7,057	147.05
April 30	Indianapolis	32	6,585	205.75
May 1	Attica, Ind	23	3,580	155.65
May 1-2	Springfield, Ill	78	22,760	290.50
May 9	Indianapolis	38	4,975	130.90
May 14	Madison, Wis	56	13,835	247.05
May 15	Webster, Ohio	14	4,465	318.92
May 16	Osborn, Ohio	35	16,215	463.30
May 17	Williamsport, Ohio	46	11,240	244.35
May 23	Des Moines, Iowa	48	15,390	320.60
May 24	South Omaha	81	7,529	92.95
June 6	Preemption, Ill	53	9,065	171.03
June 4	Chicago	44	31,900	725.00
June 5	Chicago	15	16,095	1,073.00
June 5	Chicago	11	6,990	635.45
June 5	Chicago	15	10,870	724.66
June 5	Chicago	19	10,945	576.10
June 7	Orion, Ill	49	8,275	168.90
June 19	Indianapolis	19	3,945	207.63
August 7	Chicago	43	28,245	656.85
September 3	Hamline, Minn	50	13,450	269.00
September 20	Plover, Iowa	47	9,700	206.40
September 26	Louisville, Ky	37	6,850	185.00
October 3	Newton, Iowa	41	26,590	646.35
October 3	Newton, Iowa	9	7,955	883.90
October 3	Newton, Iowa	3	445	148.33
October 3	Newton, Iowa	1	155	155.00
October 4	Newton, Iowa	41	9,050	220.75
October 2	New Sharon, Iowa	52	18,260	351.15
October 9	Morning Sun, Iowa	18	9,540	530.00
October 9	Morning Sun, Iowa	20	6,065	303.25
October 16	Delaware, Ohio	24	2,780	116.25
October 17	Perry, Ohio	80	6,910	86.37
October 16	Columbus Junction, Iowa	47	5,245	115.50
October 17	Kalona, Iowa	26	6,015	231.00
October 23-24	Kansas City	50	16,840	377.00
October 16	Lindenwood, Iowa	10	1,075	107.50
October 11	Miles, Iowa	39	6,085	156.00
October 29	Sutherland, Iowa	49	16,975	346.00
October 30	Sutherland, Iowa	38	11,880	312.63
October 31	Sutherland, Iowa	52	17,385	344.30
October 30	Newton, Iowa	38	3,610	95.00
November 1	Lancaster, Wis	49	5,115	104.30
November 2	Clarksville, Ohio	43	4,370	101.60
October 29	Montrose, Ky	41	3,380	82.45
October 30	Paris, Ky	59	5,705	96.50
October 31	Winchester, Ky	35	4,050	115.70
October 31	Rockville, Ind	20	2,340	117.00
November 6	Kansas City	44	10,070	228.85
November 7	Chicago	45	50,545	1,123.22
November 5	Mineral Point, Wis	51	9,805	192.30
November 15	West Liberty, Iowa	44	25,565	581.00
November 14	Indianola, Iowa	50	25,330	506.60

Table showing average prices of purebred beef cattle in 1901—Continued.

SHORTHORNS—Continued.

Date of sale.	Place of sale.	Number sold.	Total.	Average price.
November 8	Galesburg, Ill	52	$11,640	$223.85
November 9	Galesburg, Ill	50	7,790	155.80
November 13	Kansas City	50	6,980	139.60
November 12	Kansas City	50	12,915	258.30
November 14	Indianapolis	115	21,195	184.32
November 19	Monroe, Wis	51	7,920	155.30
November 20	Douglas, Ill	30	7,405	246.80
November 15	Mulberry, Ind	33	3,425	103.75
December 3	Chicago	69	43,760	634.20

ANGUS.

Date of sale.	Place of sale.	Number sold.	Total.	Average price.
January 10-11	Chicago	101	17,105	169.35
February 7	Indianapolis	47	6,510	138.50
March 6-8	Chicago	143	68,630	479.95
March 20-21	Kansas City	30	6,510	217.00
March 20-21	Kansas City	37	10,660	288.10
March 20-21	Kansas City	26	5,455	209.80
March 20-21	Kansas City	14	2,570	183.60
April 29-30	Kansas City	103	20,975	203.65
May 7	Indianapolis	41	5,865	143.00
May 8-9	South Omaha	110	24,930	226.65
June 11-12	Chicago	71	18,304	257.81
November 6-7	Chicago	95	16,495	173.63
November 15	Indianapolis	55	5,435	98.80
November 15	Sharpsburg, Ill	25	5,525	221.00
December 5	Chicago	96	33,055	344.00

HEREFORDS.

Date of sale.	Place of sale.	Number sold.	Total.	Average price.
January 21-25	Kansas City	50	21,160	423.20
January 21-25	Kansas City	70	24,135	344.79
January 21-25	Kansas City	25	8,195	327.40
January 21-25	Kansas City	19	11,100	584.21
January 21-25	Kansas City	30	8,350	278.33
February 5-6	Indianapolis	71	16,180	227.90
February 7-8	Kansas City	117	18,810	160.75
February 15	South Omaha	46	8,780	190.85
February 14-15	Fort Worth, Tex	65	15,415	237.15
February 14-15	Fort Worth, Tex	33	7,210	218.50
February 14-15	Fort Worth, Tex	37	6,750	182.45
February 19-20	Kansas City	55	14,275	259.55
February 19-20	Kansas City	20	5,620	281.00
February 19-20	Kansas City	14	3,165	226.10
February 19-20	Kansas City	15	3,665	244.33
February 26-28	Kansas City	45	17,260	383.55
February 26-28	Kansas City	10	2,505	250.50
February 26-28	Kansas City	47	13,515	287.60
February 26-28	Kansas City	48	10,835	225.70
February 26-28	Kansas City	49	13,700	279.60
February 26-28	Kansas City	2	1,360	680.00
April 2-3	Kansas City	165	16,270	98.60
May 8	Indianapolis	76	15,915	209.40
May 21-22	Chicago	98	33,620	343.00

Table showing average prices of purebred beef cattle in 1901—Continued.

HEREFORDS—Continued.

Date of sale.	Place of sale.	Number sold.	Total.	Average price.
September 4-5	Hamline, Minn	71	$14,440	$203.35
September 24-25	Louisville, Ky	65	19,450	299.00
October 6-7	Chicago	79	18,105	229.15
October 9	Chicago	59	7,865	133.30
October 22-24	Kansas City	135	34,190	253.25
November 13	Indianapolis	71	11,475	161.62
November 21-22	National Stock Yards, Ill	112	18,465	164.85
December 4-5	Chicago	96	36,525	380.00

POLLED DURHAMS.

Date of sale.	Place of sale.	Number sold.	Total.	Average price.
April 8	Marshalltown, Iowa	20	3,955	197.75
April 15	Newton, Iowa	27	4,655	172.00
May 1	Attica, Ind	40	5,145	128.60
May 9	Indianapolis	10	1,240	124.00
May 15	Webster, Ohio	35	11,705	331.57
June 19	Indianapolis	24	9,175	382.33
October 16	Delaware, Ohio	42	8,040	191.44
November 12	Indianapolis	45	8,710	193.50

GALLOWAYS.

Date of sale.	Place of sale.	Number sold.	Total.	Average price.
October 25	Kansas City	35	4,710	131.75
December 6	Chicago	33	9,405	285.00

RED POLLS.

Date of sale.	Place of sale.	Number sold.	Total.	Average price.
May 3	Tonti, Ill	42	8,730	207.85
June 18	Fairfield, Nebr	37	9,510	257.03

GENERAL AVERAGES.

Breed.	Number sold.	Total.	Average.
Shorthorns	4,045	$1,136,290.95	$280.91
Angus	894	248,025.00	277.43
Herefords	1,885	458,305.00	240.80
Red Polls	79	18,210.00	230.50
Polled Durhams	243	52,625.00	216.56
Galloways	68	14,115.00	207.57
Grand total	7,214	1,927,570.95	267.20

HOW TO INTRODUCE OUR CATTLE INTO MEXICO.

All efforts for the introduction of breeding cattle into Mexico have heretofore been made by private individuals. This being the case is why it has been an easy matter for unscrupulous men to impose inferior animals upon Mexicans as purebreds. Our own breeders, by some system of cooperation, ought soon to be able to overcome the prejudice now in the minds of Mexicans, and to adopt methods of shipment and exhibition of cattle which will prove satisfactory to both buyer and seller. The Mexican buyers desire to see the animals which they purchase, and it is useless to expect good prices while they are in their present frame of mind if they are not permitted to see what they are buying. It will take time and fair dealing to overcome this requirement, but no doubt it can be done. The proper thing to do at this time, in opening up a market in Mexico, is to bring the buyer, the seller, and the cattle together.

The methods of reaching the Mexican buyer must be left to the breeders to determine. It seems to be the consensus of opinion of the consular officers that cattle should be on exhibition at all of the principal fairs held in the republic, and also at the larger cities. Proper precautions should be taken to prevent loss when cattle are sent to districts infected with Texas fever. Hon. Charles W. Kindrick, consul at Ciudad Juarez, Chihuahua, says:

> Something should be done to get the purebred stock of the United States before the Mexican ranchmen. It is impossible to take herds of bulls from one part of the State to the other to exhibit them. The railroad facilities are too limited, and it would be out of the question to drive them from place to place across the arid plains and mountains. It occurs to me that something might be done, perhaps under the patronage of Government, to establish an exhibition of purebred stock in Ciudad Juarez. From November to March the breeders could ship stock here where feeding would be comparatively cheap, since hay and grain delivered at El Paso or Juarez is at a nominal price. During the season I mention, the ranchmen, many of them, visit the border, and more would come if such an exhibit existed to attract them. With an arrangement of this kind they could see the stock, could gain all the necessary information about it, and would, no doubt, when properly impressed, buy annually a sufficient number of bulls to give them a high class and heavy strain of range cattle.

KIND OF CATTLE TO EXPORT.

It must be remembered that the demand in Mexico is for the beef breeds. Some Holsteins have found a market there, but they were purchased more for their beef qualities than for their milking qualities. The Mexicans want meat, not milk; and since the practice is beginning to be adopted there of selling animals by weight instead of by the head, as has been the custom heretofore, the demand is for large animals.

The point is made by some importers into that country that the blooded stock centers of the United States are north of what is known as the Texas fever line, and therefore those centers can not be drawn upon for supplies, owing to the fact that the cattle would contract Texas fever and in all probability die. It is suggested by one of the consuls that animals for export to Mexico should, consequently, be drawn from the Southern States, where the cattle are all supposed to be immune. A distinction should, however, be made between infected and uninfected sections of Mexico. The elevated portions of Chihuahua and Sonora and probably of other States of Mexico are apparently free from Texas fever infection, and if protected by a quarantine line such as we have in the United States would remain safe for our Northern cattle. It would not be advisable to send cattle from our fever district to these regions, as they might carry infection to the susceptible animals raised there, and thus create a bad impression. Cattle from our Southern States might, however, be used with advantage in the coast districts or other infected parts of Mexico. These infected districts might, also, be supplied with cattle made immune by inoculation, a method now being used for improved cattle sent from our Northern States to Texas and other States within the fever district. Experiments with reference to this method of immunization have been conducted at the experiment station of the Bureau of Animal Industry.

MEXICAN GOVERNMENT REGULATIONS.

A few months ago the Government of Mexico made an amendment to its tariff laws with reference to blooded cattle, wherein during the year ending June 30, 1902, blooded cattle are admitted free upon the presentation of a certificate signed by any Mexican consul as evidence that the cattle are purebred. Heretofore a pedigree of each animal was required. It is believed that present concessions will be continued.

LITERATURE IN SPANISH LANGUAGE.

All literature of an advertising character which is sent to Mexico should be printed in the Spanish language. This is a point which ought to suggest itself to breeders; but it is true that much advertising matter which is printed in the English language is sent down there. The easier it is made for the Mexicans to understand the points we are making for our purebred cattle, the more certain are we to be able to do business with them.

BREEDERS' ORGANIZATIONS.

American Shorthorn Breeders' Association, John W. Groves, secretary, Springfield, Ill.

American Hereford Cattle Breeders' Association, C. R. Thomas, secretary, 225 West Twelfth street, Kansas City, Mo.

American Aberdeen-Angus Breeders' Association, Thomas McFarlane, secretary, Harvey, Ill.

American Galloway Breeders' Association, Frank B. Hearne, secretary, Independence, Mo.

American Devon Cattle Club, L. P. Sisson, secretary, Newark, Ohio.

American Sussex Association, Overton Lea, secretary, Nashville, Tenn.

The Red Polled Cattle Club of America (incorporated), J. McLain Smith, secretary, Dayton, Ohio.

American Polled Durham Breeders' Association, Fletcher S. Hines, secretary, Indianapolis, Ind.

American Polled Hereford Cattle Club, Warren Gammon, secretary, Des Moines, Iowa.

Brown Swiss Cattle Breeders' Association, N. S. Fish, secretary, Groton, Conn.

LETTERS FROM CONSULAR OFFICERS.

CHIHUAHUA.

From W. W. Mills, United States consul at Chihuahua, Mexico, dated April 13, 1901:

This consular district, comprised of the southern half of the State of Chihuahua, is one of the best cattle raising districts in Mexico. Last year one of the native cattle kings sold 36,000 head of steers, that being only the increase of his herds. These are mostly the small Mexican breed of cattle.

Of recent years some blooded bulls have been introduced from the United States, and only from the United States, and turned out with these Mexican herds with satisfactory results. The gentleman mentioned above alone imported 100 head of these bulls in 1899 and 64 head in 1900. Other ranchmen imported also, but I can not learn the total.

These bulls were three-quarter grade Herefords and cost, delivered at El Paso, $65 gold per head. To this must be added the import duty of 2 cents, Mexican currency, per kilo, which means about $6 gold per head for 3-year-olds and up. Then we must add railroad freight to the point where the animals are disembarked.

The demand for these animals will continue to increase, but I can not suggest any new means of stimulating it. I have little faith in printer's ink and pictures for Mexico. A knowledge of the Spanish language and the confidence of the ranchmen are most important.

I believe it would be a paying business to bring purebred bulls and cows to Mexico and breed them together here. The Mexicans would be more willing to buy home-raised stock, and possibly the improvement would be more rapid.

CIUDAD JUAREZ.

From Charles W. Kindrick, consul at Ciudad Juarez, Mexico, dated April 15, 1901:

For several years past there has existed in this consular district a demand for purebred cattle to be used for the purpose of improving the hardy Mexican stock. This demand, however, has been slight, considering the large ranching area. American and English ranchmen have been practically the only cattle raisers to realize the value of introducing purebred stock. They are now constantly adding Hereford and Shorthorn bulls to their herds. From the beginning they have been cognizant of the necessity of crossing the purebred animals with the natives, and now on many of their ranches the stock is heavier, more easily fattened, and commands better prices than formerly.

The Corallitos range, owned by New York people, and comprising about 1,000.000 acres, is stocked with approximately 30,000 head of cattle, nearly all, or about 90 per cent, of which have been bred from blooded Herefords and Shorthorn bulls and native cows. From 100 to 200 head of the best bulls obtainable are brought by this company annually from northern Texas and Kansas. It requires this addition each year to keep up the percentage of increase in the herds, largely on account of the nature of the range upon which they live. The rainy season in northern Chihuahua commences in July and lasts from six weeks to two months. The grass then gets practically its only annual growth and the cattle have about four months of grazing, when development is marked. For eight months in the year they progress slightly, since the grazing is sparse and scarcely sufficient to support them against the ensuing rainy season. During the eight dry months from 20 to 30 acres of average ranch land is necessary to the maintenance of each head of stock. On account of this dryness and lack of sufficient grazing for developing purposes for eight of the twelve months, the bulls become impotent, and the cows, unless they are natives or are interbred, become sterile. This is the principal reason why a fresh importation of bulls is annually necessary on a Chihuahua range.

It has been proved by the American ranch owners that the fine bulls introduced and bred with the natives increase the total percentage of production. More important still, there is a decided increase in the weight of the marketable stock thus produced.

In this district, the San Pedro range (125,000 acres) and the Corallitos range (1,000,000 acres) make annual importations from the United States of fine purebred bulls.

Ex-Governor Terrazas, of this State, the largest cattleman in Mexico, has more than 3,000,000 acres of grazing lands. Last year, as an experiment, he purchased a carload of fine bulls in Kansas and introduced them on one of his many ranges. There is no doubt that as soon as the good results of this experiment are visible he will import annually hundreds of fine bulls.

Mexican ranchmen have not purchased the fine stock nor introduced it on their ranges. The reason why they have not done so is mainly a lack of knowledge of what the results would be. They have been unable to realize why they should pay from $75 to $125 (gold) for a fine bull when they sell their cattle at so much per head and have no reason to complain of the productiveness of the native stock. There is no doubt, however, in my opinion they will follow to a large extent in the course of time the example set by the American ranchmen and ex-Governor Terrazas. There is another reason why they will soon be induced universally to improve their herds. A large packing house was recently established at Chihuahua. The stock it uses is purchased from the ranges according to weight and not by the head. The native cattle are invariably thin for most of the year, and are not heavy at any time. In fact, they have small frames, and even when corn-fed and fattened do not approximate the weight of the animals bred from the fine imported bulls and native cows.

Something should be done to get the purebred stock of the United States before the Mexican ranchmen. It is impossible to take herds of bulls from one part of the State to the other to exhibit them. The railroad facilities are too limited, and it would be out of the question to drive them from place to place across the arid plains and mountains. It occurs to me that something might be done, perhaps, under the patronage of Government to establish an exhibition of purebred stock in Ciudad Juarez. From November to March the breeders could ship stock here where feeding would be comparatively cheap, since hay and grain delivered at El Paso or Juarez is at a nominal price. During the season I mention the ranchmen, many of them, visit the border, and more would come if such an exhibit existed to attract them. With an arrangement of this kind they could see the stock, could gain all the necessary information about it, and would no doubt, when properly impressed, buy annually a sufficient number of bulls to give them a high class and heavy strain of range cattle. With cattle selling by weight, it would require no persuasion to convince them of the necessity of introducing the purebred animals among their native herds.

The following item, which appeared in a recent number of the Mexican Herald, may not be uninteresting in this connection:

"A movement has been started in this State (Chihuahua) for the breeding of half-breed cattle on a large scale. Since the purchase of Sainapachic by Mr. Oxsbeer some time since the matter has been brought prominently before cattlemen of the United States, and is already bringing results. The latest venture is said to be on the part of William Humphrey, who is reputed to be the largest individual Hereford breeder in the United States, his ranch at Ashland, Nebr., containing thousands of head of blooded stock. He has investigated conditions here, and is now negotiating for the purchase of the great Purisima ranch in the district of Bravo, and situated along the Rio Grande. The hacienda contains over 3,000,000 acres, capable of maintaining 30,000 head of cattle. A well-known stockman of El Paso recently made a visit to Chihuahua for the purpose of examining the titles which are held by the present owners (Charles Davis and the heirs of Jose Valenzuela), and, if they are found to be satisfactory, the deal will probably be made. If this is done, Mr. Humphrey will stock the ranch with native cattle and thoroughbred bulls."

On August 6, 1901, Mr. Kindrick sent some further information relative to preparations for cattle raising on an extensive scale. He writes:

What is said to be the largest ranch deal ever made in the southwest or northern Mexico has just been closed. Capt. Charles David, of El Paso, Tex., transferred the David ranch, in northeastern Chihuahua, Mexico, to the Riverside Land and Cattle Company, of Nebraska. The ranch comprises 1,200,000 acres, and lies along the Rio Grande. The price paid was 30 cents per acre, or $360,000. The purchasers are William Humphrey, of Ashland, Nebr., and George E. Ricker, of Quincy, Ill. Mr. Humphrey is president and general manager of the Riverside Hereford Company, of Ashland, Nebr., and Mr. Ricker is an Illinois banker. These gentlemen are said to be the largest Hereford breeders in America.

Mr. Humphrey states that the ranch just purchased will be stocked with 750 fine Hereford bulls and 15,000 common cows immediately. It is his purpose, he says, to give Mexican ranchmen an object lesson as to the value of purebred cattle, so that they will become purchasers of the fine bulls now raised in the United States.

Mr. Humphrey will at once construct 300 miles of barbed wire fence, and make other improvements.

The purchasers of the ranch state that it is their intention to establish a permanent exhibition of fine stock at El Paso, Tex.

DURANGO.

From Walter H. Faulkner, United States consul at Durango, Mexico, dated April 11, 1901:

The number of American investors coming here in quest of business openings has been constantly increasing the last few years, and quite a percentage of them have put their money into ranches and ranch land. As would be supposed, not content with the cattle produced in this country, they have all to a greater or less extent given their efforts and attention to a betterment of the grade by importing purebred animals from the States and mixing them with the Mexican stock. This has roused the Mexican ranchmen to realization of the superiority of American cattle and the advantages to be derived from interbreeding the two grades, until now a great many haciendas in this section have their limited number of purebred animals mixed in with the "Longhorns." It should be understood, however, that the move in this direction is only in its inception; that the demand for a better grade of cattle has only recently been created and is bound to greatly increase from now on.

The best method that presents itself to me for bringing such cattle to the notice of this people is one that has within the past year or so already been put into execution by one or two individuals for a short length of time, viz, bringing a few cars of blooded animals here, renting a suitable place near the city (in securing which there is no great difficulty), and keeping them on exhibition and for sale.

There could hardly be more room for improvement in a grade of cattle than there is here in Mexico. Mexican ranchmen are coming to realize this fact and are beginning now to remedy the evil by importing and mixing with the native stock some of the best breeds of the United States.

MEXICO.

From Andrew D. Barlow, consul-general at the City of Mexico, Mexico, dated June 5, 1901:

There is a demand in all parts of Mexico where cattle are raised for purebred animals to improve the native stock. The demand for purebred dairy stock is the most marked, and the breed of dairy stock in this immediate vicinity and in the northern part of the republic has greatly improved in the past few years. The growing demand for purebred cattle is illustrated by comparing the value of cattle imported into this country for the fiscal year of 1892–93, which amounted to $9,042, with that for 1898–99, which amounted to $162,073, the importation of cattle into this country being confined almost entirely to purebred animals.

Every encouragement is being offered to the improvement of native cattle breeds by the Government of Mexico and by many public-spirited citizens of the republic. In August last, by special act of Congress, all impost of duties on purebred cattle imported for breeding purposes were remitted, and I am informed by the Honorable Leandro Fernandez, Secretary of Fomento, that since that time he has investigated requests for the remission of duty on 146 head.

Up to the present time importations of purebred cattle into this country have been confined almost exclusively to Swiss and American cattle. It must be admitted that at present Swiss cattle are rather more in favor among the native stock raisers than American cattle, not from any lack of merit of really purebred American cattle, but because certain unscrupulous dealers have imposed inferior cattle upon native cattle raisers and breeders under the representation that they were purebred American cattle. The deception is, of course, found out sooner or later and reflects in no small degree upon American cattle or, rather, upon American cattle dealers in general. Of cattle purchased from Americans in the United States there has not been, to my knowledge, a single complaint. Such cattle have always proved entirely satisfactory, but their cost is so high as to be almost prohibitory, as will be shown more in detail in succeeding paragraphs. The practice of the Swiss Government of inspecting all cattle exported from that country and issuing certificates of the pedigrees of all exported cattle has prevented the importation into this country of any spurious Swiss cattle. In this high altitude Swiss cattle, when judiciously crossed with native cows, give a breed nearly as good as the original stock and less liable to sickness. American purebred cattle have not done well on the large ranches where they have been turned out with the herds, not being used to the hardships of ranch life; but where they have been kept penned up and cared for as in the United States they have given good results. The only objection to them is their high price. The breeds of American cattle generally imported into this country are Holstein-Friesians, Durhams, and Herefords. These cattle easily become acclimated in the northern part of the republic. A few wealthy cattle raisers have experimented with the breeding of fine cattle with rather unsatisfactory commercial results, but these results appear to have been due to conditions which could be remedied.

I have interviewed a number of leading local stock dealers who supply the Mexican markets with beef cattle, and it was stated by them that the meat industry in Mexico is as yet in its early stages of development, and quality now counts for very little in beef cattle. It would seem, however, that it is merely a matter of educating the tastes of the people, who are able to pay high prices for meat, to demand a better quality than they are now able to buy in the local meat markets. Some local meat dealers with whom I have conversed have expressed the opinion that a demand for high-grade meat could be created here and have expressed their willingness to handle such meat if they could procure it regularly. One or more packing houses are projected in this republic by American firms. A packing house is said to be now in course of construction near Uruapam by the American Beef Company, and another is said to be under way in the northern part of the republic—out of my district, however—by another American firm. These packing houses will presumably raise the standard of marketable beef in this republic and therefore create a demand for better grades of cattle. I understand that they themselves are arranging for the importation of purebred American cattle for breeding purposes.

Among cattle raisers whom I interviewed were Manuel Sainz and Juan Martinez del Cerro, wealthy men, owners of fine dairy cattle, and men of considerable experience in the raising of fine cattle. I will reproduce their joint interview as nearly verbatim as possible, as containing the gist of the remarks made by all the cattle raisers I have interviewed on this subject:

"Some of the finest cattle ever seen in Mexico," they said, "have been brought here from the United States or are the offspring of American-bred parents. We need for our dairy business cows which will produce large quantities of milk, the quality of which does not cut any figure with us, because we have only a limited demand for cream and rich milk on account of the slight appreciation of our people for rich butter and cheese. We prefer the Holsteins on this account, but have given up the buying of them in the United States because the price asked for purebred cattle by American raisers is too high. This is no fault of the American raisers, but is due entirely to the dishonesty of a certain class of dealers who make a practice of importing inferior animals, representing them to be purebred Holsteins or Herefords, or whatever the breed may be, which deceive ignorant buyers, and on account of the easy terms offered by the dealers, find a quick market.

The purchasers of this inferior stock find their customers among the more ignorant, and sell the product of bulls and cows bought by them as genuine, at prices with which the owners of purebred American cattle can not compete. Of course, the inferior stock is soon found out by the purchasers, and, as a result, American cattle are discredited, and breeders find it more to their advantage to bring their stock from Switzerland, where the law protects the legitimate raiser and makes it impossible for the dishonest dealer to palm off inferior stock upon the ignorant. With every bull or cow brought from Switzerland we receive a certificate from the authorities giving the pedigree of the animal, and we do not remember a single instance of deception practiced with Swiss cattle. If the

Government of the United States would adopt some measures to protect the trade against the tricks of irresponsible dealers and stop the exportation of inferior cattle under false pretenses. we have no doubt that American cattle would soon become the most sought after in Mexico."

From personal knowledge, I believe the views of Messrs. Sainz and Cerro to be well founded in fact. I will also give the views of Ernest Gerhart, importer of cattle, as follows:

"I believe that the most effective way to introduce purebred American cattle into Mexico would be to establish show and sales stables in the city of Mexico and another at Chihuahua, managed in the interests of the principal cattle breeders of the United States, particularly of the middle West, by an American who has had experience in this country and has a ready command of its language. The expenses of such a depot would probably not exceed $250 per month (Mexican currency), including salary, rent, help, and feed. If the interested parties would be satisfied to sell their animals, at least for the first year, on the basis of the prices they obtain at home, with the proportionate freight and expenses of their joint agency added, I believe that a great many more cattle would be imported than heretofore. A more widespread introduction of Durham and Hereford bulls in the northern part of the republic would benefit the United States, which buys a considerable number of young range cattle from the State of Chihuahua, and the same class of bulls and Holstein cows would find increased demand in the southern part of Mexico."

I will quote a statement made to me by the Hon. Leandro Fernandez, Minister of Fomento, as follows:

"I believe that, to promote the importation into this country of fine-blooded cattle from the United States, it will be necessary for the cattle raisers of the United States to reduce their prices, for the real obstruction to the importation of American cattle is to be found in the high, I might say almost prohibitive, prices."

This remark is worthy of serious consideration. It would seem to me to be expedient for American cattle raisers to sell stock to Mexican cattle raisers at very low prices for a time, to encourage the importation of American cattle into this country, and to create a steady demand for the American pure breeds.

In 1894 an organization was formed in Coyoacán, a suburb of this city and the immediate vicinity, of private individuals or individuals acting in a private capacity, known as the Coyoacán Fair Association, or the Sociedad Anónima de Concursos en Coyoacán, which association held a live-stock show in the same suburb in January, 1895, and has held a similar show each year since that time. Cattle form so important a part of this live-stock show that it may almost be called a cattle show. The object of the association is purely to encourage the breeding of fine stock in Mexico, and it is doing a most praiseworthy work in that direction. For exhibitors of cattle or other stock at this annual fair, all expenses of transportation and maintenance are paid by the association, whether the exhibitors be native or foreign. The fair association received the assistance of the Government in the matter of transportation. At the last annual fair of this association, held in October last, several American cattle raisers had exhibits brought thither from the United States, and other American cattle raisers in this republic were well represented. In the matter of prizes the American exhibitors were very successful. The fair was well attended by representative stock raisers, and the American exhibitors sold a number of head of cattle to them. I would recommend that American raisers of purebred cattle be well represented at the succeeding fairs of this association.

Summing up the methods by which the importation of American purebred cattle into this Republic may be encouraged, I would respectfully suggest the following measures:

First. An inspection of alleged purebred cattle exported to foreign countries by the United States Government, to protect the honest cattle raisers in the United States and to preserve the high reputation of American purebred cattle abroad. If this be impracticable, I would respectfully suggest—

Second. That the leading raisers of purebred cattle in the United States cooperate to prevent the exportation of inferior cattle from the United States to foreign countries under the representation that they are purebred. An organization of American raisers of purebred cattle, with funds appropriated for that purpose, could probably prevent in large measure the imposition of inferior cattle upon cattle raisers in this and other foreign countries under the representation that they are purebred by assisting the government of such countries and cooperating with them in enforcing their laws. Such an association might register purebred cattle and become responsible to foreign buyers for the accuracy of pedigrees issued by it. It might maintain in this and other foreign countries permanent cattle exhibitions and employ competent men to study the particular needs of each section and ascertain what breeds of American cattle would do best in that section. I believe that the expenses of such an association would be repaid many times over to the individual members.

NOGALES.

From J. F. Darnall, consul at Nogales, Mexico, dated April 15, 1901:

The improvement of the native cattle in northwestern Mexico is comparatively in its infancy. On the border between Mexico and Arizona this matter has assumed some importance. Mr. Colin Cameron, of Arizona, one of the largest stockmen on the border, and a few others of like note have for the past few years been giving this subject much attention, and, as I believe, with profitable results to themselves and a wonderful benefit to the cattle raisers of Mexico. The improvement in the stock of cattle has been marked throughout a large space of country by the efforts of these few gentlemen. On the border the dairymen, who are operating on a small scale, as fast as they can are changing their native cows to the improved breeds of the United States. Persons engaged in shipping such cows to Nogales for the past two years find a ready market for them at remunerative prices.

One other important factor in improving the native stock of Mexico is the Mexican Hereford Breeding and Importing Company, of Chihuahua, Mexico. This company is composed of gentlemen from the United States, with Mr. J. M. Curtice, of Kansas City, as president. The Mexican Farmer and Stockman, a journal published by this company both in the English and Spanish language, with illustrations, is being widely distributed. Where it is desirable to prosecute the business of introducing purebred cattle into Mexico on an extensive scale, I am not able to conceive of a better plan than that adopted by the aforesaid company. On a less extensive scale, according to my judgment, the only true road to satisfactory results is to bring seller and buyer together, coupling this with the estabing of agents when necessary. This would not be hard to do, for it must be remembered that American herdsmen are all the time becoming more and more numerous in Mexico. Notwithstanding this latter fact, I would urge the importance of the representatives in Mexico being able to understand and speak the Spanish language.

Diverging somewhat from the question in hand, I wish to say in a general way that the quicker the American exporter abandons the idea of taking and holding the trade of Mexico by correspondence only, the better. The door of opportunity is opened in northwestern Mexico for the breeders of purebred cattle. The field is large. Sonora alone embraces about 76,000 square miles. Cattle raising must ever be one of the principal industries, not of Sonora alone, but of the adjoining States.

MATAMORAS.

From P. M. Griffith, United States consul at Matamoras, Mexico, dated March 23, 1900:

Mexico contains a great many haciendas admirably adapted and almost exclusively devoted to the raising of cattle. A fact which is attracting general interest here is that every season shows an improvement in the care taken of the animals, and also in the class imported. The stockmen throughout this country are taking such an interest in this direction and have imported so many purebred cattle from the United States that on many haciendas one may find animals which compare favorably with those on noted breeding farms in the North. In former years they consisted exclusively of the old long-horned Spanish and Mexican types, which have large bones and frames and long legs but are deficient in flesh. This deficiency is certainly not due to the country. for the climate, grass, water, and general topography are decidedly favorable to animal growth and comfort, and while it is a generally recognized fact that Mexican stock is inferior to United States animals, it is the prevailing opinion that a cross between the pure blood of the North and the cow acclimated here produces a large, healthy, vigorous offspring, with an unusually compact muscular development.

MONTEREY.

From Philip C. Hanna, consul-general at Monterey, Mexico, dated April 17, 1901:

For the past four years the exportation of cattle from Mexico has been large, due to the American-Spanish war and the consequent high price. Now, however, the conditions have changed, so far as exportation is concerned, but the exodus, if I may use the term, during the term adverted to has given the Mexicans a new idea as to the breed of cattle, and their eyes are now open and directed to the United States for a better breed. It is thought in this connection that special attention should be given by those interested in our country to the exportation into Mexico of the Herefords and Holstein cattle and Angora goats. In the judgment of this consulate-general, the Hereford is more adaptable to Mexico; but the opinion is divided as to this, save that many prefer the Jersey. As to goats, there is no more profitable business in Mexico than the raising thereof. In the business of this office the shipment of hides of that animal constitutes one of the most important items. There is a large field for the introduction of the Angora, and to anyone who undertakes it this consulate-general predicts great success. As to the introduction of animals of the character reverted to—as, in fact, anything else—those interested must send a competent person, thoroughly conversant with the Spanish language and the business, and associate with the native element interested. Without doubt the blooded-stock associations in the United States could introduce "stock shows" in the cities and towns of Mexico that would make a valuable impression on the Mexican stockmen and would prove an advantage to stock raisers of both countries. If any of our people wish to resort to advertising, our consuls will gladly furnish them with such lists of Mexican newspapers in the Spanish language as will be most likely to reach the Mexican ranch owners. The field is simply immense, and it only remains with the breeders in America to embrace it.

SALTILLO.

From Charles Burr Towle, at that time United States consul at Saltillo, Mexico, dated April 20, 1901:

There is not at present any demand within the limits of this consular district for purebred cattle for improving native stock.

This is a mountain consulate, at an altitude of 5,500 feet above sea level, and there are no cattle ranches within its boundaries, the country not being suitable for same. Conditions here differ very much from those a few hundred miles north or south in Mexico, there being practically no breeders of cattle in this vicinity. There are a very few dairymen who import their stock; but there is no market here which would warrant breeders in the United States in making an effort to bring the attention of the few stock growers to their cattle.

VERA CRUZ.

From William W. Canada, United States consul at Vera Cruz, dated April 30, 1901:

There is but a very small demand for purebred cattle in this district, and there have been but very few brought into the district from the United States, as they do not do well if brought direct to this low altitude. I have been informed that but very few live long. They frequently take sick in the night and are dead by morning.

The best method seems to be to ship them to the higher altitude of Mexico first, and acclimate them by bringing them down to the sea level by degrees. No doubt it is better to breed them in higher altitudes of Mexico and bring them down when they are less than a year old.

I am of the opinion that a large ranch of purebred cattle located near Jalapa or Orizaba in this State could do a good business.

The American Breeding Company, of Chihuahua, State of Chihuahua, are doing a profitable business. They publish an illustrated paper, which is sent to the cattle men of the republic, and I am sure that this is the best method of securing the attention of the stock growers of Mexico. I believe that a catalogue, well illustrated with pictures of the various breeds of cattle, placed in the hands of the cattle men would result in many orders. The same is true of high-bred horses, chickens, and dogs.

I directed a letter to Hon. Alexander M. Gaw, who is a special agent appointed by Governor Dehesa of this State, and one to Mr. H. J. Langdon, who lives about 100 miles from here, in one of the best cattle districts; and I inclose their replies. I also inclose a letter from the Mexican Hereford Breeding and Importing Company. [The last letter mentioned contains no information.]

[Inclosure.]

JALAPA, *April 15, 1901.*

DEAR SIR: In reply to your letter of the 12th instant, I would say that the stock men of this section fully realize the unquestioned importance of introducing into their herds heavier cattle in order to improve the native stock.

As to the demand for purebred cattle, by which I understand you mean full-blooded, registered stock, while I know of some instances of the importation of cattle of this class, I am inclined to think that the higher cost and the risk in acclimatizing are factors unfavorable to any very great demand, though there is some demand. There is considerable business in graded stock and cross strains. In reply to your question as to the methods by which the attention of stock growers may be secured, I have no doubt that advertisements in the Mexican newspapers would elicit inquiries.

Yours, truly, ALEX. M. GAW.

Hon. W. W. CANADA,
United States Consul, Vera Cruz, Mexico.

MEXICAN COMMERCIAL COMPANY OF ILLINOIS,
Tlacotalpan, V. C., Mexico, April 28, 1901.

DEAR SIR: This reply to your letter of the 13th instant has been delayed, owing to my absence at the plantation for the past ten days.

Replying to your question as to the introduction of thoroughbred cattle into this country, I will say: I have had many inquiries from Mexicans as well as Americans within the past year asking where and how good cattle could be procured; and while I do not think the demand would be great for some time, I do think if there was some source of supply in this district a good demand could be created.

The best method of introducing them would be to establish headquarters on some ranch in this district, where good shipping facilities can be had for loading on the river steamers, and then sending out circulars to all the American and Mexican ranchers in the Sotavento (south coast of Vera Cruz) district, informing them where they can be had. In this way people desiring good stock could come at small expense to where the cattle can be seen, and make their own selection. This would also apply to thoroughbred hogs, for which there is always a good demand. Following this plan, I think there is no question as to the establishment of a profitable business for the importer, and it would also be of great benefit to the country.

Yours, very truly,

H. J. LANGDON.

Hon. W. W. CANADA,
United States Consul, Vera Cruz, Mexico.

TAMPICO.

From Samuel E. Magill, consul at Tampico, Mexico, dated July 12, 1901:

The demand for purebred stock in this part of Mexico is limited to a very few of the wealthier ranchers, but the need for such animals is great.

The native cow is a fairly good animal, notwithstanding years of inbreeding, and the average of weight would be greatly increased by the introduction of Durham, Hereford, Angus, or Holstein.

Throughout the Huasteca, a fertile district to the south and west of Tampico, may be found some cattle with the marks of better blood than the average, indicating that, in times past, attempts have been made on a small scale to breed up some herds.

About a year ago several carloads of blooded cattle were brought here under contract, but the parties who brought them tried to dispose of another shipment without success, owing to the fact that the first lot was not up to expectations.

The local cattle dealer of means desires good blooded cattle and is willing to pay a reasonable price for what he gets, but will not again order in advance. Three carloads of good animals can be sold here at once.

Animals for this market should be brought here from south of the quarantine line of Texas, as several species of ticks are common here which would endanger the health of animals brought from points farther north.

I am reasonably sure that the cattlemen here will not again buy without seeing the animals first, so would deem it useless just now to send them literature, advertisements, or photographs. The trade will commence when some one here demonstrates the success of improved breeding, and the others will follow as a matter of self-preservation. I believe such example will come from some of our cattlemen moving here, where lands are cheap and grass is good, bringing with them some of the best breeds and giving a practical demonstration of the value of well-bred over common cattle.

I am reliably informed that an American cattle man has been quite successful in the importation of Holstein bulls for breeding to select native cows for dairy purposes. His ranch is near Tuxpan, about 90 miles south of this city. But such enterprises, as a rule, will not be profitable for the rancher until cattle are bought by the weight and not by the head, the latter being the local custom—although the local buyers tell me that, when buying a herd, they take into consideration the size of the animal—and until the retailer in the large cities of the interior demands a better animal with greater development of the loins and hind quarters.

Just as in the United States, the demand of the consumer in Northern States and in Europe for the finer cuts of beef made the packer of the middle West demand a better animal from the feeders of Missouri and Iowa, whose demand in turn of the breeder of the West and Southwest made our breeding cattle what they are now, so will the demand for a better-bred animal in this part of Mexico come, when it does, from the natural market in the cities of the interior and from Yucatan on the feeder of the Huasteca, who will in turn insist upon the breeder of Coahuila and Tamaulipas furnishing him with a better animal, for be it known that almost without exception throughout the Republic of Mexico beef is sold by the retailer to the consumer in hunks cut from the bones with little regard as to the part of the animal from which the hunk comes.

MAZATLAN.

From Louis Kaiser, United States consul at Mazatlan, Mexico, under date of April 16, 1901:

There have been quite a number of American cattle imported into this district. I find that the experiment has proved satisfactory as well as profitable, and I know of no reason why there should not be a good business established in importing cattle to this coast.

In my opinion the best way to call the attention of the native stock raisers to the purebred cattle of the United States, would be for the Secretary of Agriculture to forward printed matter on that subject to the stock raisers and importers in Mexico. If this is not feasible, the exporters of cattle should correspond with the stock raisers here, using the Spanish language if possible.

It is difficult to name the kind of cattle wanted, as some prefer the Holsteins, some the Shorthorns, and some the Polled Angus; but Jerseys are not in demand, owing to their small body. Mexicans desire a large breed of cattle for butchering purposes. Butchers' stock is continually in demand at remunerative prices.

Cattle raising has been given considerable attention by the better class of farmers in Mexico, and the interest will no doubt grow in the near future. In this connection, I would state that one of the largest cattle sales on record was made by a Mexican stock raiser in the adjoining State of Chihuahua, who sold 400,000 head of cattle at one sale.

YUCATAN.

From Edwin Thompson, United States consul at Progreso, Mexico:

There is at present an increasing desire upon the part of cattle owners to import purebred bulls from England and the United States as a means of improving the native stock. Strictly speaking the desire has long been with many of the cattle breeders, but until the present era of exceeding prosperity in Yucatan, by reason of the high price of sisal hemp, their means have not been commensurate with their ideas. Now that they have the money they are going into the importation of fine-bred cattle with enthusiasm. Indeed some of them are going into this line of procedure with an abandon and vigor that is not only childlike but which borders on foolishness. For example, two young men whose incomes are, by reason of present prices of sisal grass, unusually large, thought that they would have a model milk and dairy farm in tropic Yucatan. Accordingly they went to Mexico City (a high cool tableland region and climate), and there inspected and bought at good prices 16 blooded cows and several bulls to serve as a base for their model dairy and stock farms. These animals were indeed fine looking: of a Swiss breed, I think. They were in their element while in the model farms upon the high cool tableland of Mexico: but when brought to Yucatan they sickened and died one by one. Some lived nearly a year, but at the end of a twelvemonth those that were not dead were nearly so, and thus the foolish attempt to make a breed of cold-climate cattle thrive in a hot land like Yucatan came to its certain end.

Among thinking cattle breeders the present idea is to import simply bulls, and thus build up from the small-framed but hardy and well-built native stock a class of cattle suitable to the climate and peculiarities of the soil.

The climate of southern Florida is quite similar to that of Yucatan, and cattle that will endure the climate of the above-mentioned portion of the United States soil will probably thrive in Yucatan. All breeds have been tried here, but cattle breeders have generally settled upon the Holstein and the Durham as the breeds best adapted to stand the rigors of the climate and the forage of the country.

The Durhams are considered the best for meat, but the Holstein the best "all-around" cattle. Mobile has within the last year sent a great many cattle to Yucatan, some for breeding and milking purposes and others for food. A certain percentage of these die from a kind of fever, but many live—enough to produce a decided result in the future breeding of the primitive native stock.

A very large stock raiser of the United States visited me some two years ago, and, after duly studying the native cattle, stated his belief that they were first-class stock to breed upon and produce cattle of a superior class.

I shall be most pleased to answer in detail the queries of any stock sellers in the United States. Any circulars, etc., sent me will be duly distributed where they will reach the persons interested.

NUEVO LAREDO.

From J. F. Kimball, vice and deputy consul at Nuevo Laredo, Mexico, dated April 6, 1901:

There is not much demand in this district for purebred cattle for the improvement of the native stock.

It is generally so drouthy on this frontier that the stock raisers are afraid to invest in fine stock. During the long drouths, which occur here almost annually, the stock have to subsist principally on the cactus and brush, for which the longhorns seem best adapted. Unless irrigation could be made a success, I would not like to venture even a guess as to when there may be anything like a general demand in this section for the higher grades of stock.

The attention of the stock raisers in this district might be attracted, first, by extensive advertising showing the great advantage of raising purebred stock; second, by the stock growers in the States visiting or sending agents to the ranches of this country to explain to the growers here the advantage of the fine breeds over common stock; third, by shipping in exhibits of fine stock, showing them at central points. The high rise in meats within the last few years will, in the near future, lead to a mighty effort on the part of the growers here to raise a larger class of stock.

LA PAZ.

From James Viosca, United States vice-consul at La Paz, Mexico, dated April 19, 1901:

The barren condition of this peninsula, which is due to its protracted drouths and natural sterility, would seem to make it a most uninviting country for raising stock of superior quality.

During the last months cattle have been dying off in numbers, and those that are left are subsisting entirely on the various species of cacti.

A few experiments have been tried with imported California stock, but these, as a rule, could exist only by keeping them in stables.

As an investment it is far from presenting any promise of success in this district, and consequently I can not suggest any methods to offset the above facts.

ACAPULCO.

From George W. Dickinson, United States consul at Acapulco, Mexico, dated July 10, 1901:

With reference to the inquiry as to whether there is a demand in this consular district for purebred cattle for improving the native stock, I have to report that, after consulting with such ranchmen as come within my reach, there is no demand at present; but, in my opinion, a demand could be easily created by sending good, persistent representatives into the republic to place the matter properly before the people.

TUXPAN.

From Edwin R. Wells, United States vice-consul at Tuxpan, Mexico, dated May 2, 1901:

I report, after a careful examination of a radius of 40 miles, that there are no stock ranches of sufficient size and number which are desirous of improving the small herds that they have. The cost of bringing in improved animals is too great, as they must be landed at Tampico and driven overland to the ranches. The largest cattle ranches here have only about 200 head.

AGUAS CALIENTES.

From A. M. Raphall, United States commercial agent at Aguas Calientes, Mexico, dated April 15, 1901:

There is no demand for purebred cattle in this district. The experiment has been tried and failed on account of the climate, or probably want of care.

REPUBLIC OF MEXICO.

Mr. A. B. Hulit, corresponding secretary of the Kansas Reciprocal Association, with offices at room 14, Office Block, Topeka, Kans., and who has an office also at Chihuahua, Mexico, writes to this Bureau, under date of December 31, 1901, as follows:

I have been interested since my boyhood in fine stock, and when I went to Mexico eight years ago to found a newspaper called Modern Mexico, now published at New York City, I saw there a wonderful field for the sale of our purebred animals. I at once began the study of the situation, finding that under the natural conditions obtaining there, so far as climate and grass were concerned, Mexico is a natural breeding ground for cattle. I found there, however, a lack of interest on the part of the native stockmen with reference to the subject of improving their herds that was indeed striking. In fact, bad laws, poor shipping facilities, coupled with the disadvantage of poor markets and still poorer packing facilities, did not justify a very great interest; but conditions have changed rapidly, for laws are amended and altered, railroads are ample, and new packing companies are springing up, so that ere long Mexico will be a cattle country in all that is necessary to insure a profitable business.

High lands are fairly well grassed and watered, and being at so high an elevation, the cattle are not affected with Texas fever or any other injurious diseases. Sheep find here a natural home, but there is occasionally some scab, due to neglect, although, owing to the mildness of the climate, it is not serious. Dipping facilities are now being introduced rapidly, and these will soon make scab a thing of the past. Ranches are owned, which fact prevents the passing of flocks from one section to another, thus preventing the spread of this disease.

It is not safe to take our Northern cattle to the tropics or semitropics, because of the prevalence of the Texas fever tick; those regions will have to be stocked from the Southern States, where cattle are immune from Texas fever.

On the whole, I see no good reason why, owing to the fact that the native stock in Mexico is very poor, that we can not sell millions of dollars worth of our stock there. The cattle which I took to Mexico were taken upon the invitation of the Mexican Government, to be exhibited at the Government fair held at the City of Mexico, where they won the grand prize as the best herd of cattle. They were Herefords, and created no small amount of interest, as they were the first of this kind of cattle ever exhibited there. The President presented me the grand prize in the presence of many of the leading men of Mexico, and spoke on this occasion in such a manner that I feel able to say to my fellow-stockmen of America that the Government of Mexico and her leading men appreciate our stock and will make us welcome in that country.

O

U. S. DEPARTMENT OF AGRICULTURE.

BUREAU OF ANIMAL INDUSTRY—BULLETIN NO. 42.

D. E. SALMON, D. V. M., Chief of Bureau.

EMERGENCY REPORT ON SURRA.

BY

D. E. SALMON, D. V. M.,
Chief of Bureau of Animal Industry,

AND

CH. WARDELL STILES, PH. D.,
Pathologist of Bureau of Animal Industry.

WITH A

BIBLIOGRAPHY OF SURRA AND ALLIED TRYPANOSOMATIC DISEASES.

BY

ALBERT HASSALL, M. R. C. V. S.,
Acting Assistant Zoologist of Bureau of Animal Industry.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1902.

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Animal Industry,
Washington, D. C., March 29, 1902.

Sir: I have the honor to transmit herewith, and to recommend for publication as Bulletin No. 42 of this Bureau, under the title of "Emergency report on surra," a manuscript prepared by Dr. Stiles and myself in response to a request from the War Department for information regarding the present knowledge concerning the disease known as surra. There is appended to this article a "Bibliography of surra and allied trypanosomatic diseases," prepared by Dr. Hassall.

It is of importance that not only our officers in the Philippines, but also our sanitary officers and veterinarians in this country should immediately become familiar with the chief points concerning this malady. It is true that animals from the Philippine Islands are now excluded from landing in the United States, but it is also true that some animals were landed before it was known that surra existed in the Philippines. The possibility is therefore by no means excluded that such animals have brought this disease with them. If once thoroughly introduced into the United States, surra would cause a loss of millions of dollars, and on that account it is advisable that this bulletin should have a wide circulation so that the essential points in connection with the disease may become known, not only to veterinarians and health officers, but also to stock owners, in which event the malady may promptly be recognized if met with, and the proper measures may be adopted to stamp out the infection.

Very respectfully,

D. E. Salmon, *Chief of Bureau.*

Hon. James Wilson, *Secretary.*

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EMERGENCY REPORT ON SURRA.

SUMMARY.

Surra has been diagnosed among the horses in the Philippines, and has led to the prohibition of landing any animals from those islands at any ports of the United States or of the dependencies thereof.

This disease is caused by a microscopic parasite (*Trypanosoma Evansi*) which lives in the blood, and the evidence now accessible indicates that this organism is transmitted by means of biting flies, especially by members of the genus *Tabanus* (horseflies); other methods of dissemination are not excluded. It is chiefly a wet-weather disease, and is reported as invariably fatal to horses and mules. It occurs in other animals—such as camels, elephants, dogs, cats, etc.—more rarely in ruminants, and may be transmitted to goats, sheep, and other mammals, but is not yet reported for birds. It is more or less common in India. Its introduction into the Philippines is unexplained, but it has probably existed there for some years past.

Parasites closely allied to this species occur in Europe, Africa, and South America, in some cases causing diseases known as tsetse-fly disease, dourine, mal de caderas, and rat trypanosomiasis. Certain authors believe that some of these maladies are identical with surra.

The chief symptoms of surra are fever, of an intermittent, remittent, and sometimes relapsing type; urticarial eruption; petechiæ on the mucous membranes; progressive anemia and emaciation; ravenous appetite and extreme thirst; more or less paralysis.

Treatment has not been satisfactory, but arsenic has been followed by good results in some cases. Prevention is difficult, but should consist in protecting horses from flies. Immediate isolation of the sick animals and protecting them from flies will result in restricting the disease. In some cases it will perhaps be better to kill and immediately destroy the diseased animals.

From both the military and the economic points of view surra must be looked upon as a very serious matter, and its introduction into the United States would result in very heavy losses.

INTRODUCTION.

ORIGIN OF THE PRESENT REPORT.

A cablegram from Major-General Chaffee, Manila, P. I., asking for information regarding surra, has been referred to this Bureau. This dispatch reached us simultaneously with a preliminary report on a parasitic disease prepared by Dr. John G. Slee, formerly an inspector of this Bureau, so that we conclude that since the report was mailed the diagnosis of surra has been made. Dr. Slee's letter reads as follows:

OFFICE OF THE INSULAR BOARD OF HEALTH FOR THE PHILIPPINES,
Manila, P. I., October 24, 1901.

DEAR SIR: I inclose a few notes upon a new disease that has appeared in the islands this season among the native and foreign horses (I use the word foreign, as we have American, Australian, and Chinese ponies, in all of which I have noted the trouble). The parasite was first discovered in the blood of a horse taken by myself to the laboratory of the board of health, but for further information and many experiments made I am indebted to Dr. J. J. Kinyoun, United States Marine-Hospital Service.

By a later mail I shall probably be able to give further information, but at present I should like very much to obtain an idea of what we have found, and if you know of a similar parasite—if there is any literature on the subject. Dr. Kinyoun seems to think that it is entirely new.

I am, very respectfully,
JOHN G. SLEE, D. V. S.,
Assistant Veterinarian, Board of Health.

Dr. D. E. SALMON,
Chief of Bureau, Washington, D. C.

[Inclosure.]

NOTES ON A NEW DISEASE OF HORSES.[a]

During the past rainy season a disease of a febrile type affecting the foreign and native horses has been noted by the veterinarians.

The history was at first very obscure, the disease usually being far advanced when first seen, the death rate high, and treatment unsatisfactory.

The resident veterinarians and horse owners had noted the same conditions in former years, which they described as calentura, or fever, but did not think it had been so widely spread or the mortality so large as during the present season. Dr. H. H. Muecke, veterinarian of the Land Transportation Corral, says that he had not noted it during the past two seasons, but he was able to give considerable information concerning the disease as it appeared this season in the Government horses.

That the disease was widespread was evident from the reports to the board of health, and investigation showed it to be generally present in the island of Luzon. In one place all the native horses had died, while of the Government stock about one-half were affected.

The first cases in native horses came under notice about the first part of June, and presented swellings of the sheath, legs, and pads under the belly, in many respects similar to those of purpura; the membranes were colorless, hemorraghic spots were present on the membrana nictitans, but no petechial spots were observed on the Schneiderian membrane, as in purpura. These were not seen in the foreign horses. There was always a temperature, very irregular, from normal at times to 105° F. In the native horses the disease would not run a very long course, anorexia appearing in the final stages, followed by death.

When the horses in the corrals became affected the symptoms could be more easily noted. This was simply due to the fact that the native never notices that an animal is sick until it is past recovery. I have seen horses with a well-advanced case being used.

In the corral the sick animal at first showed a temperature of from 103° to 107° F.; pulse full; breathing increased and abdominal; appetite variable, from poor to good, but never entirely lost; the membranes slightly injected, but no hemorrhagic spots, as noted in the native animal. The swellings of the belly, sheath, and legs soon appear. In some cases they may not be present, emaciation taking the place, but in the native horses swellings seem to be always a marked symptom. At this point the temperature is variable, of an intermittent character, and is not controlled by any of the febrifuges; it may be higher immediately after giving medication than before. Some of the cases last for a long time, being in the hospital for two or three months, and ending in recovery or death. If the swellings suddenly disappear, death soon follows in the native horse; but this is also a symptom of recovery in the foreign horse.

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[a] Same as Slee, 1902a, pp. 819-821.

As the disease progresses toward a fatal termination the animal grows very weak, particularly in his hind legs, weaves from side to side when walking, and may go down and be unable to rise.

The feces are of a normal character, no marked constipation or diarrhea being present; the urine seems to be increased in quantity, but as to color or changes I have been unable to note particulars.

Postmortem.—No special lesions are found, the organs and tissues showing an anemic condition, but in some cases abscesses were noted in the stomach and abdominal cavity. The pericardial sac and pleural cavity are always full of a serous fluid, but no appearances of inflammatory changes are present; antemortem clots are found in the heart.

As there were so many cases the disease was supposed to be of a contagious type, but this did not seem probable, as in a stable of several horses one would be affected and the others remain healthy, although the horses were standing side by side and eating out of the same manger.

The character of the disease being so much like malarial fever, the infection was looked for from some other source and a parasite in the blood was suspected. Upon the examination of the blood of a well-marked case, an animal parasite was discovered which was also found in all the cases examined. In the new cases the parasites were seen, and as the cases progressed they increased in number, but toward recovery they grew less and finally disappeared.

The parasite is an animal organism, rather blunt at one end, with a flagellum at the other; in advancing the tail seems to advance, becomes entangled with the corpuscles, and it drags itself forward. It can go backward, but the most of its movements are with the tail advancing. They are of different sizes, the smaller seemingly a male, the larger a female. They often come together, the blunt ends being attached and the flagellum moving very rapidly.

That they have some action on the red blood corpuscles is very evident, as the blood count is diminished and the leucocytes increased.

Where the parasite comes from is not known. To learn its life history will probably necessitate examination of the fly and mosquito, for the disease is widespread, and the affected animals are fed and watered in so many ways (the Filipino depending upon grass and rice, while the Government stock have hay and oats), that this would in a measure exclude feeding as a source of infection.

After the present report was nearly completed, we received, through the courtesy of Dr. George M. Sternberg, Surgeon-General, United States Army, the following report by Drs. Allen M. Smith and J. J. Kinyoun, dated Manila, October 17, 1901:

A PRELIMINARY NOTE ON A PARASITIC DISEASE OF HORSES.[a]

By ALLEN M. SMITH, *Captain, Assistant Surgeon, U. S. A.*, and J. J. KINYOUN, *Surgeon, U. S. Marine-Hospital Service.*

On October 15, 1901, information was given us by J. W. Jobling, assistant bacteriologist of the board of health at Manila, that an epidemic sickness of an undetermined nature was now prevailing in this city, and also that he had just taken a specimen of the blood from a sick animal which on examination revealed the presence of a parasite. Whether this was accidental or was the causative agent of the disease in question, he was unable to say. On investigation and inquiry, it was learned from the veterinarian in charge of the corral of the quartermaster's department and from the city veterinarian that there was now and had been a fatal epidemic among the horses in Manila, the quartermaster's department having lost over 200 within the last four months.

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[a] Same as Smith & Kinyoun, 1901.

One of the corrals was visited by us on the 15th instant, where we were shown by the veterinarian in charge 20 horses and mules ill with an undetermined disease. These animals presented the several stages of the malady. Some were quite recently attacked, while others had been ill for over two months.

The symptoms first noticed are impairment of appetite, constipation, fever, and thirst. These are followed within a few days by a rapid and progressive emaciation.

The temperature for the first few days ranges from 104° to 107° F.; the pulse is full and strong. This may be termed the acute state. Then begins an asthenic stage, which may terminate fatally within a variable period, or by a slow convalescence. During this stage, usually within ten days after the onset, there appears a commencing edema above the belly, involving the soft parts; coincident with this, or soon after, the edema extends to the feet and legs. The pulse becomes rapid, weak, and dichrotic; the respiration increased, shallow, and jerky; the gait staggering. Emaciation is rapid and extreme.

The disease has a tendency to relapse; this may occur at any time, even after convalescence appears to have been fully established. The relapses are invariably fatal.

The mortality in this epidemic has been about 75 per cent for American horses and mules and 100 per cent for native ponies.

The gross pathology shows serous effusions into the pleurae, pericardium, and sometimes the peritoneum. There is also a serous exudate into the cellular tissue of the legs and abdomen. The organs are pale, but otherwise normal in appearance.

At the time of our inspection, 5 acute cases were examined, the duration of the attack being from 6 days to 2 weeks. All these animals presented the several clinical appearances as above described.

Blood specimens were taken from the jugular vein of each and examined microscopically shortly afterwards. In 4 of these a parasite was demonstrable. The other was negative, but a specimen taken the following day showed the presence of this same parasite.

On the day following, specimens were obtained from 12 others, all chronic cases, with the result of finding this same parasite in the blood of 4. In 3 they were few, while in the fourth they were present in great numbers; as many as 20 could be seen in one microscope field. The animal from which the specimen was taken had suffered a relapse.

It would appear that the parasite may disappear from the peripheral circulation, or exist there in such few numbers that it is not easily demonstrable after the acute stage has passed. It would require repeated blood examinations to decide this point.

Description of the parasites.

The parasite resembles a whip-like worm, having much the appearance of the *Trichocephalus dispar*. Its length is from 10 to 14 microns, and it is from 1 to 1.2 microns in diameter through its body; the neck is nearly one-half its length, tapering gradually to a point representing the mouth (?). It has a limiting membrane which is well defined; the contour is in most cases symmetrical, but in some the body line is quite irregular. The larger part of the parasite (body) contains granular material and clear spaces, which latter vary in size and number; they are irregularly distributed, and may encroach on the wall so as to cause irregular outline. The granular material does not extend to the neck.

The parasite is actively motile, having both a vermicular (contractile) and spiral movement. It moves forward in a very peculiar manner; the long whip-like process is thrust forward by a spirillar motion, followed by a contraction of the body.

We have not so far been able to determine its intimate structure, further than the limiting membrane, and the protoplasmic substance of the body.

Two sizes of the parasite have been seen in all the specimens examined; the larger appears to be more numerous and contains considerably more granular material than the smaller, and usually two or more vacuoles. Whether these two sizes represent male and female has not been determined. We are inclined to believe from our observations that these do represent the male and female, because we have observed, in more than half the fresh specimens, the joining of a large and small parasite in such a way as to appear to be something more than accidental.

The pathological change caused by this parasite is a rapid destruction of the red blood cells causing an acute anemia. The changes occur in the blood coincident to the invasion of the parasite. In one horse which had been ill 7 days the red blood cells numbered 3,500,900; the white cells, 14,500. In another, ill 6 weeks, the red blood cells were 3,200,000, and the white were 13,900. The blood of a healthy horse, taken as a comparison, gave red blood cells 6,900,000; white, 9,800. There is also a slight diminution in the amount of hemoglobin—about 85 per cent.

After convalescence has been fully established no parasites can be found; the blood gradually assumes its normal constitution.

The parasite is not confined to the blood, as it can be demonstrated in the serous effusions.

It is quite easy to detect. All that is necessary is to make a microscopical examination of fresh-blood films; a one-sixth-inch objective will suffice. Dried films, fixed, and stained with any of the nuclear dyes.

The organism appears to be a strict parasite. It lives but a short time after removal from the body. The longest time which it has been kept alive in blood serum was not more than 10 hours.

The parasite has many of the properties in common with the filaria and resembles more nearly that of the *Filaria perstans*, only it is smaller and its movements dissimilar. Yet, on the other hand, the clinical history of animals infested by it—the changes occurring in the blood, the lesions observed in postmortem—point very strongly toward its classification with the spirochæte.

The mode of transmission has not yet been studied. It does not appear to be highly contagious, as it does not appear to spread from one to another, even under the most favorable circumstances.

It more nearly resembles malaria in this respect. It is more than probable that its extra corporeal state is different, or another supposition equally tenable is that its intermediate host is some insect, such as the fly or mosquito.

ARMY PATHOLOGICAL LABORATORY, *Manila, October 17, 1901.*

Dr. Kinyoun has now returned to the United States, and, according to information we have received from him, the disease found is beyond question identical with surra. It further appears from his letter that Mr. Jobling made the first observation on the disease in Manila. Dr. Kinyoun adds:

> From what I could learn, the disease surra appears to be distributed all over Luzon and has been there for many years. No one seems to know where it came from. I do not think it came from China, as no cases have been reported in Hongkong, where a considerable number of artillery horses are kept.

OBJECT OF THE PRESENT REPORT.

As the disease known as surra is not present in the United States, and as the American text-books on medicine discuss it but briefly, it becomes necessary immediately to place our army officers, our veterinarians, and our live-stock raisers in a position to recognize the malady. should it be introduced into this country. From both a military and an economic standpoint it is also imperative that our officers and sanitary officials now serving in the Philippines should be placed in possession of the present status of knowledge regarding the disease in question. To meet these necessities the present emergency report has been prepared.

IMPORTATION OF PHILIPPINE ANIMALS PROHIBITED.

Immediately upon receiving word that surra existed in Luzon, the Secretary of Agriculture issued the following order prohibiting the importation of any live stock or animals of any kind from the Philippine Islands into the United States:

SPECIAL ORDER PROHIBITING THE LANDING OF ANIMALS FROM THE PHILIPPINE ISLANDS AT ANY OF THE PORTS OF THE UNITED STATES OR OF THE DEPENDENCIES THEREOF.

(*B. A. I. Order No. 92.*)

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., December 13, 1901.

Notice is hereby given to the owners, officers, and agents of all steamers and other vessels of all descriptions plying between the Philippine Islands and any of the ports of the Hawaiian Islands, or between the Philippine Islands and any of the ports of the United States or the Territories or dependencies thereof, and to all stockmen and all other persons concerned in any way or manner in the traffic in animals in or with the Philippine Islands, that certain contagious, infectious, and communicable diseases dangerous to the live stock of the United States exist among the animals of the said Philippine Islands, viz, surra, affecting horses, mules, asses, neat cattle, camels, buffaloes, dogs, and apes; foot-and-mouth disease, affecting horses, neat cattle, other ruminants and swine; and rinderpest, affecting neat cattle and other ruminants.

Therefore, under the authority conferred upon me by the act of Congress approved May 29, 1884, entitled "An act for the establishment of a Bureau of Animal Industry, to prevent the exportation of diseased cattle, and to provide means for the suppression and extirpation of pleuropneumonia and other contagious diseases among domestic animals," I do hereby prohibit the landing at any of the ports of the Hawaiian Islands or at any of the ports of the United States or of any of the dependencies thereof of any live stock or animals of any kind from the Philippine Islands. This prohibition will take effect immediately and will continue in force until otherwise ordered.

JAMES WILSON, *Secretary.*

TERMINOLOGY.

TECHNICAL NAME.

As there is no Latin term signifying an infection with *Trypanosoma*, and as there is considerable confusion in the vernacular names, we herewith propose to introduce the term *trypanosomiasis*, referring to any infection of any animal with parasites belonging to the flagellate family Trypanosomidæ.

This technical term is therefore analogous to the terms *acariasis*, *ascariasis*, *coccidiosis*, *uncinariasis* (uncinariosis, anchylostomiasis), and *malaria*, in that it is a broad generic term which does not indicate what particular species of the family Trypanosomidæ is present, or what particular host is affected. It does not do away entirely with the names "tsetse-fly disease" and "surra" any more than the term coccidiosis does away with the terms "intestinal, hepatic, or renal coccidiosis," and it has the same general relation to the terms "tsetse-fly disease" and "surra" which the term "malaria" has to "tertian, quartan, estivo-autumnal, human, and avian malaria."

VERNACULAR NAMES.

The technical name *trypanosomiasis* is intended to cover the following vernacular names, compiled from various sources and based either upon prominent symptoms of the disease or upon the hosts of the parasite:

Andar-tap (fever within the body).
Anémie pernicieuse.
Berbad (on wind, wasted away, or spoiled).
Bovine surra (surra of cattle).
Buffalo surra (surra of buffaloes).
Camel surra (surra of camels).
Canine surra (surra of dogs).
Dog surra (surra of dogs).
Doaia (second stage, swelling over the chest).
Equine relapsing fever (at least in part).
Equine surra (surra of horses).
Fish surra (surra of fish).
Galtah (from Gala, meaning throat, as Galtah is a form of surra in camels in which the throat affection is one of the prominent symptoms).
Galtia (melting away).
Glossinose.
Gum-Zaharbad (concealed blood poison).
Horse surra (surra of horses).
Khanhog (first stage, refusing food).
Khusk-Zaharbad (dry blood poison).
La mouche—in Congo.
Marri (plague).
Nikalgaya (passed away, hopeless).
Nagana (tsetse-fly disease).
N'gana (tsetse-fly disease).
Nygana (tsetse-fly disease).
Pernicious anemia of horses (at least in part).
Phenta (fatal).
Phenta-ká-darad.
Phera (bursting of abscess).
Pheta (fatal).
Phetra (abscess).
Phitgaya (burst).
Photra (abscess).
Purana (used up).
Rat surra (surra of rats).
Relapsing fever of equines (Steel, 1886).
Sár (rotten).
Sara (rotten, foul).
Sokra (without flesh and blood, skeleton).
Sukal (drying up).
Surra (third stage, rapid waste).
Tap-dik.
Tapé-dik.
Táp (fever).
Tarai (wet, moist).
Tebersa (three years' duratic
Tibarsa.
Trypanosomose.
Tsetse-fly disease.
Tzetze-fly disease.
Wabai-ki-bokhar (epidemic fever).
Zaharbad (blood poison).
Zherbad (poison wind or miasma).

DIFFERENT KINDS OF TRYPANOSOMIASIS.

At present there are several different kinds of trypanosomiasis usually recognized, but certain authors are of the opinion that at least some of the diseases in question do not in reality represent distinct maladies caused by different species of parasites. We may mention the following in particular:

Surra: A disease of equines, camels, elephants, and certain other animals in India, attributed to *Trypanosoma Evansi.* (See pp. 18, 35.)

Nagana, *nygana*, or *tsetse-fly disease*, of Africa: Affecting cattle, horses, mules, asses, antelopes, camels, and certain other animals; it is attributed to *Trypanosoma Brucii.* (See pp. 36, 110.)

Dourine, or *maladie du coït*, of Algiers, France, and Spain: It attacks the horse and the ass in particular, but may be transmitted to certain other animals; it is attributed to *Trypanosoma equiperdum.*

Mal de caderas, of South America: It affects horses, asses, cattle, hogs, and certain other animals, and is attributed to *Trypanosoma equinum.* (See pp. 37, 124.)

Rat trypanosomiasis: Attributed to *Trypanosoma Lewisi.* By some authors this parasite is alleged to be identical with the horse surra organism, but it is quite certain that rats may harbor a distinct species. (See pp. 33, 125.)

In our present state of knowledge, it is best, for the present at least, to look upon these five maladies as distinct diseases, in the same sense that human and avian malaria are considered as due to distinct, though closely allied, organisms.

SURRA.

DEFINITION OF SURRA.

Surra is a specific and continuous infectious febrile disease occurring in solipeds and camels, and capable of being transmitted by inoculation to other animals. It is due to the presence of a flagellate protozoon (*Trypanosoma Evansi*) in the blood. It is chiefly met with in an epidemic form, during certain months of the year, namely, during or immediately following the wet seasons. It is characterized by an intermittent, remittent, and sometimes a relapsing, type of fever which continues for varying periods, from a few days to months, according to the species and the constitutions of the animals attacked, and presents definite symptoms following one another in regular sequence. The chief symptoms, in addition to the fever, are the occasional appearance of an urticarial eruption, general or localized, closely following the first rise in temperature, but which may make its appearance at any time during the course of the disease; then the presence of petechiæ on the mucous membranes, chiefly those covering the membrana nictitans; lachrymation, and the exudation of a yellow semigelatinous material into the subcutaneous and other connective tissues. There is rapid wasting and great weakness, although in the great majority of cases the appetite remains good throughout, no matter how high the fever is. There is extreme pallor of the visible mucous membranes, and this is followed at a later period by yellowness. From first to last there is progressive anemia; the blood at first presents a normal character, but after a varying period of time undergoes marked changes. The white corpuscles are increased in number, and the red corpuscles usually cease to form normal rouleaux, lose their individuality, and run together, forming irregular masses, which are at first dark, but gradually, as the disease advances, almost entirely lose their coloring matter and become pale.

The presence of the flagellate is not continuous during the whole course of the disease. At first it is usually found in small numbers in the blood, and increases with greater or less rapidity until, having attained a maximum, it disappears either gradually or suddenly, to reappear after an interval. The periods during which it is present in and absent from the blood are marked by extreme irregularity, varying from 1 to 6 days, but the latter number is very unusual.

The disease is invariably fatal, death being generally due to exhaustion, but sometimes to concurrent complications. After death no specific lesion is present, but as a rule there are small subpleural and subendocardial extravasations, together with enlargement of the liver and spleen, and if death takes place during the paroxysm the hematozoon will be found for a certain time in the blood. (Lingard, 1893, pp. 1–2.)

GEOGRAPHICAL RANGE OF SURRA.

According to Lingard (1899, pp. 1–2), the geographical range of this disease is much wider than was once imagined:

"Among the first recognized districts in India were Dera Ismail Khán, on the northwestern frontier, east of the Indus, where the disease has been known for generations, Asni near Rájanpur, Kohat, Upper Burmah, the Island of Bombay, Konkan, Meerut in the Northwest Provinces, in the Berárs, and in Cachar and Assam. It was also reported from the Persian Gulf, Persia, and Tonquin. There were also strong reasons for believing that animals have succumbed to this disease in Abyssinia, the Zambesi, East Africa, Australia, North America, Brazil, and Southern Europe.

"Since the publication of the above report numerous fresh centers have been brought to light. Out of the 31 districts in the Punjab, surra has been found up to the present to be enzootic in 22, the worst being the Karnal district. In the Northwest provinces the disease has been observed in the Saharanpur, Muzzafarnagar, Meerut, Bulandshahar, Gaziabad, and Fyzabad districts; in the northeast portion of the Jalpaiguri district, Bengal. In addition widespread outbreaks have occurred in the Ahmedabad, Baroda, and neighboring localities, which have carried off thousands of equines. Spontaneous cases of surra have also been recognized in Lower Burmah, Rájputana, and Bikanir. One horse also arrived in Bombay from the Persian Gulf suffering from surra.

"In other parts of the world the *Trypanosoma* has been reported from Algeria (equines), France (bovines), Korea (equines and bovines), Egypt and Syria (equines), while in Zululand a *Trypanosoma* has been observed in the blood of equines, oovines, and canines, which is indistinguishable microscopically from the flagellated protozoon found in the circulation of animals in India."

We are not familiar with the data which led Lingard to indicate that animals have succumbed to surra in North America, but it does not seem impossible that a confusion with Texas fever has arisen. The references to Africa apparently refer to nagana, which Lingard considered identical with surra. Further, the possibility does not appear to be absolutely excluded that some other cases of alleged surra may have been erroneous diagnoses of other maladies, especially in cases where the deaths are taken from reports not based upon blood examinations

HISTORY OF SURRA.

Surra has been known in India for several generations. It was first brought to the attention of the rest of the world in a report to the government of India, written by Griffith Evans, M. D., published November 13, 1880. Since that time numerous papers on the subject have been printed, especially by physicians and veterinarians in the service of the English Government. Alfred Lingard, imperial bacteriologist in India, has been especially active in his researches, and has published a number of exceedingly valuable reports on the subject, containing numerous clinical histories, tables, analyses, etc. The other workers who have made valuable contributions to the surra literature may be seen from the references and the bibliography of the present report.

ORIGIN OF SURRA IN THE PHILIPPINES.

Our information from Manila is not yet sufficiently detailed to enable us to judge with certainty whether surra has existed many years there or whether it was recently introduced. If it has been recently introduced, it seems very possible, from our present incomplete knowledge of the exact data, that it was carried to China by the English troops from India, and that our troops carried it from China to the Philippines. This explanation is, however, purely in the line of speculative possibility, and is not in accord with the statements made by Dr. Slee (see pp. 12–13) and Dr. Kinyoun (p. 15), though from present accessible data it does not seem to be entirely established that the disease mentioned as existing in previous years was of the same nature. The point in question can be established in the Philippines better than by us here in Washington.

CLIMATIC INFLUENCES GOVERNING SURRA.

All authors agree that surra is a disease which coincides with moist conditions, occurring during or immediately following the heavy rainfalls, although it is admitted that sporadic cases may occur at other seasons of the year—for instance, those which are hottest. In the same way it is described as being influenced by floods and inundations, and as being common in the vicinity of water, as canals, rivers, etc.

Lingard (1893, p. 49) refers to 85 cases of naturally acquired surra which he compiled from the records of the Bombay Tramway stables, and shows that 84 of these, or 98.8 per cent, occurred during the months of September to December.

The following passage from Lingard (1899, pp. 73–74) bears upon this point:

RAINFALL AND SURRA.

> "The question as to what conditions influence the early or late advent of surra in horses is one of especial interest and importance, both from a practical and scientific standpoint. It is only in government and private establishments, however, where careful records are collected concerning the disease, that details can be obtained from which deductions of any value can be drawn. In 1890, efforts were made in this laboratory to compile statistics with a view to determine what effect is produced on the appearance of the disease by the varying amount of rainfall in different years. At present we have obtained statistics for the past ten years with regard to the date on which the disease first made its appearance at the stables of the Bombay Tramway Company, together with the records of rainfall during the same period.

Table showing the monthly rainfall in Bombay for the years 1888–1897, with the dates of surra outbreaks, and the number of horses attacked in each surra season at the Bombay Tramway Company's stables.

MONTHLY RAINFALL.

Months.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
January	1.85						0.22			0.01
February	.02					0.14		0.07		
March	.10			0.20			.06			
April			0.01			.02	.01			
May		0.67	.06		0.11	6.30		.08	0.26	
June	15.76	19.89	24.55	13.99	13.30	21.47	16.87	17.84	28.02	14.40
July	22.47	30.15	21.34	32.48	23.86	16.14	26.16	18.04	36.44	30.19
August	11.43	10.32	10.61	6.94	36.56	13.57	8.40	15.97	20.77	13.82
September	4.92	2.71	6.45	22.53	18.73	7.52	12.04	11.91	1.62	20.60
October	.11	3.80	.58	1.04	1.89	.45	3.08	3.62	.01	2.51
November	1.16		1.25		.67	1.63		.06	.53	
December			.13			.22	.01			
Total rainfall for year	57.82	67.84	64.98	77.18	95.12	67.46	66.85	67.59	87.65	81.53
Total rainfall from May 1 to date of outbreak of surra	54.69	61.97	63.56	66.50	84.87	39.41	44.09	52.02	85.49	81.52

Table showing the monthly rainfall in Bombay for the years 1888–1897, etc.—Continued.

OUTBREAKS OF SURRA.

Year.	Date of outbreak.	Year.	Date of outbreak.
1888	Oct. 18	1894	Aug. 11
1889	Sept. 14	1895	Sept. 2
1890	Oct. 6	1896	May 9 Aug. 30
1891	Sept. 13		
1892	Sept. 12	1897	Nov. 26
1893	July 20		

NUMBER OF HORSES ATTACKED EACH YEAR.

Year.	Number attacked.	Year.	Number attacked.
1888	14	1893	11
1889	47	1894	10
1890	2	1895	17
1891	1	1896	19
1892	15	1897	3

July 20, 1893, 3 horses attacked—1 Australian, 1 Arabian, 1 Persian.
May 9, 1896, 1 case of surra, most unusual.
August 30, 1896, regular outbreak commenced.
November 26, 1897, 3 Australians at Parel stables. Flies very troublesome.
Average annual rainfall for ten years, 73.40 inches.
Average for ten years, 67.35 inches.
Average death rate from surra for ten years, 13.9.

"As will be observed on reference to the above table, the most common months for surra to appear (six times out of ten) were September and October; twice it appeared in August and once in July and November, respectively. When a rainfall of 6.3 inches fell in Bombay in May, 1893, 3 horses were attacked on the same day, namely, July 20. It was then considered that the disease might be accounted for by the hematozoon or its resting form having escaped the great heat during the month of May, and so have retained its vitality, so that its power of reproducing the disease would be increased by the earlier rainfall, and the outbreaks of surra thus occur sooner. But in 1896 a sporadic case of surra occurred among the same stud, consisting of some 700 horses, on the 9th day of May, a most unexpected occurrence, as up to that time only 1 animal (Australian, No. 65, owned by a private individual) had been observed with the disease, and that was contracted in the districts. From the 1st of the previous November until May 9, 1896, only 0.06 of an inch of rain fell, and that was in the first-mentioned month. Consequently, here we have undoubted proof, confirmed by microscopic examinations of the blood of the animal, that surra may appear in Bombay in the hottest part of the year, when no rain has fallen for 6 months. In 10 years 1 animal out of 139 attacked with surra developed the disease in the month of May, but the annual outbreak at these stables which carried away 17 horses did not occur until September, October, and November of the same year, toward the end of the monsoon season. On the other hand, it is a well-established fact that in the great majority of years during which an excess of rain falls, the most severe outbreaks of surra occur. In support of this statement the following outbreaks may be brought forward. During 1894 heavy rain fell on several successive days in September in the Ahmedabad, Baroda, and neighboring districts. Thousands of equines succumbed to surra during the October and November following, over an area of 400 square miles; and by order of the Government the horse fair at Ahmedabad was abandoned for a period of 2 years.

"Again, on the Saharanpur-Mussoorie dâk line, 77 animals died of surra, at stations in the Mohand Pass, during the rains of 1894, when the rainfall was in considerable excess of the normal.

"In 1895, during the rains, which were heavy, surra caused its ravages in over 200 villages in the Karnal district, Punjab. The losses among equines in 16 villages in the above tahsil, where statistics were forthcoming, were 253 out of 556 kept, or 45.5 per cent. During the same period 53 villages in the Saharanpur district, northwest provinces, lost 909 out of a total of 1,590, or 57.1 per cent.

"Let us now consider the outbreaks which occur annually at the foot of the outer Himalayas at Kathgodám in the Kumaon Bhabar. At my request, meteorological observations were commenced at this station in 1896, and the following table shows the information we require, but for the past 2 years only:

Table showing rainfall June 1 to October 31, in inches.

Stations.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.
Naini Tal, elevation 6,350 feet	123.02	81.85	63.73	126.91	105.19	85.10	63.85	114.93
Kathgodám, elevation 1,630 feet	....	....	....	....	....	....	50.71	108.52
Haldwani, elevation 1,200 feet	100.06	65.91	56.38	83.73	92.96	69.16	63.82	91.86
Average number of horses	90	93	93	180	128	131	101	80
Horses died (of surra) between the Brewery and Kathgodám	40	10	5	2	63	8	92	2

"In 1896, 19.4 inches of rain fell during the month of June, and at the time that the monsoon ceased somewhat abruptly in August, 50.31 inches had fallen. Surra broke out among the dâk animals in July, and 32 succumbed up to the end of August. When I visited the station on the 5th of September, the blood of 24 ponies was found to contain the organism on microscopical examination, and in 9 animals it was found within the next few days, making 33 in all. Different varieties of flies make their appearance during the fine intervals of the monsoon, and in the year in question, when the rains terminated in August, flies invaded the tonga road in very large numbers, but no examples of the *Glossina morsitans* were discovered. As the diseased animals were not destroyed, or even isolated, we have not far to seek for the cause of the terrible mortality among the tonga ponies. In the following year (1897), the rains only commenced on the 12th of July, but continued until the month of October, a total of 108.52 inches falling. During the last-mentioned season, however, immediately a tonga animal was reported with fever, it was at once segregated, some miles away from the rest of the ponies, with the result that only 2 animals have succumbed to surra during the season. It would also appear that the lateness of the setting in of the monsoon, together with the heavy downpour when it set in, and want of sunlight and warmth, also contributed and brought about conditions unfavorable for the development of the *Trypanosoma* and flies in general.

"With regard to surra in other than tonga ponies, it is no good the railway company going to great trouble and expense in order to provide boiled water, grass from an elevation of 6,000 feet, clean corn, prohibiting the use of green vegetation during the rainy season, and segregating all their sick animals, if small private owners of ekka and riding ponies, etc., are allowed to keep their diseased animals in sheds or wandering about unattended within a few yards of the company's stables or are allowed to ply for hire along the same narrow road. It stands to reason that the myriads of flies which abound and infest all animals at these seasons have only to carry the contagion a distance of a few yards from the diseased to the healthy animals. In order to save expense and trouble, the native owners, on recognizing that their tats are suffering from a fatal disease, turn them loose to shift for themselves; consequently they become a source of danger to every healthy animal in the neighborhood during life, and a disagreeable stimulus to the olfactory organs of passers-by for a varying period after death."

The explanation that the hematozoon would have its power of reproducing increased by rainfall should, perhaps, be accepted with some reserve. At least, another explanation occurs to us which seems more in accordance with analogy. In dry weather biting flies are not so active as in moist weather, and flies which are in a pupal stage are not so likely to issue. When a rain comes, however, flies issue from the pupæ in the dry ground and proceed to breed rapidly. Thus, during and following rainfall there would be more biting insects flying, hence there would be a greater chance for spreading the malady. (See pp. 21 47.)

RESIDENCE IN INFECTED COUNTRY.

Of 80 cases compiled by Lingard (1893, p. 49), 16.25 per cent occurred in animals which had been in the country for varying periods of less than 1 year; 76.25 per cent succumbed within the first 7 of the 14 years under observation.

INFLUENCE OF SEX, AGE, AND BREED.

According to Lingard (1893, pp. 47–48), sex plays no rôle in reference to surra; both mares and horses are affected. Of 85 animals referred to, 45.8 per cent were between 5 and 9 years old. Of these same animals, 80 per cent were Australians, and the statistics of the Bombay Tramway Company show that Australian horses are much more subject to the disease than are the Asiatics. White and gray mules are said to be more susceptible than darker animals.

SPECIES OF ANIMALS SUBJECT TO SURRA.

Surra is found especially in horses, asses, and mules, but is not confined to these species. Outbreaks of the disease are reported also for camels, elephants, cats, and dogs, and the disease has been transmitted by inoculation to cattle, buffaloes, sheep, goats, rabbits, guinea pigs, rats (*Mus decumanus*, *Nesokia providens*), and monkeys. The limits of its infectivity are not yet established, and on this account all mammals must, for the present, be considered as *possible* carriers of the malady until negative experiments prove them to be refractory. No birds, reptiles, amphibia, or fish are known to harbor the parasite (*Trypanosoma Evansi*).

PARTIAL LIST OF OUTBREAKS.

From the high mortality of surra, it may be seen that this disease is exceedingly important from both an economic and a military standpoint. In order to give an idea of the losses which have occurred, the following partial list of the outbreaks, compiled by Dr. Albert Hassall, is here appended:

1878.

PUNJAB.

Griffith Evans, 1881, p. 2: Fourth Punjab Cavalry lost 40 horses.

1879.

Griffith Evans, 1881, p. 2: Fourth Punjab Cavalry lost 118 horses.

1880 (to September).

Griffith Evans, 1881, p. 2: Fourth Punjab Cavalry lost 114 horses.

Before 1881.

ARSENE.

Griffith Evans, 1881, p. 2: Third Punjab Cavalry lost 350 horses from surra a few years ago.

1885.

HUNG-HOA.

Blanchard, 1888: Many mules in Twelfth Regiment Artillery died of an affection designated at Tonkin under the name anémie palustre, fièvre ou cachexie palustre.

Before 1887.

Burke, 1891, p. 270: Bengal Cavalry, 180 horses died.

Before 1890.

KATGODAM, NORTHWEST PROVINCES.

Lingard, 1894a, p. 1: Many tonga ponies (principally cabulis) succumbed to surra.

1890.

FAZILKA TEHSIL, FEROZEPUR DISTRICT.

Lingard, 1898a, p. 8: Lost a few animals.

KATGODAM, NORTHWEST PROVINCES.

Lingard, 1894a, p. 1: 40 ponies also died.

MANIPUR.

Lingard, 1895, p. 1: 80 out of 230 equines died. Elephants unaffected.

1891–1893.

KATGODAM, NORTHWEST PROVINCES.

Lingard, 1894a, p. 1: 15 ponies died between 1891–1893.

1891–1894.

SHUTRA-KHÁNA STUD AND GANGU RISALD.

Lingard, 1895, p. 2: 740 camels have died of surra.

1892.

WAZIRABAD TEHSIL, GUJRANWALA DISTRICT.

Lingard, 1898a, p. 8: 5 horses and 10 asses.

1892–1896.

SONEPUT TEHSIL, DELHI DISTRICT.
Lingard, 1898a, p, 10: 48 horses, 38 mules, and 8 asses died.

1893.

BOMBAY.
Lingard, 1894a, p. 1: A horse arrived in the port of Bombay from the Persian Gulf suffering from surra.

BURMAH.
Lingard, 1894a, p. 1: The Kachnis lost 14 elephants from the disease, out of a total of 32.

CHINDWIN.
Lingard, 1895, p. 2: Bombay-Burmah Company lost 24 elephants, valued at 45,000 rs.

SÁHÁRÁNPORE AND MUSSOORIE.
Lingard, 1894a, p. 1: Outbreak occurred in the stables of the dâk ponies.

SECUNDERABAD.
Lingard, 1895, p. 1: First Madras Lancers lost 49 country-bred horses.

WAZIRABAD TEHSIL, GUJRANWALA DISTRICT.
Lingard, 1898a, p. 8: 3 horses and 5 asses.

1893–1894.

GÁIKWÁRI DISTRICT.
Lingard, 1895, p. 1: A large number of horses and donkeys died all over the district.

MUSSOURIE ROAD, BETWEEN SAHARANPUR AND RÁJPUR.
Lingard, 1895, p. 1: Owners of dâk ponies lost 146 animals from surra.

1893–1895.

WAZIRABAD TEHSIL, GUJRANWALA DISTRICT.
Lingard, 1898a, p. 8: Several horses and mules died, being equivalent to 45 per cent of the animals possessed.

1893–1896.

FEROZEPUR TEHSIL, FEROZEPUR DISTRICT.
Lingard, 1898a, p. 8: 17 villages affected.

1894.

AJNALA TEHSIL, AMRITSAR DISTRICT.
Lingard, 1898a, p. 9: Lost 62 horses, 34 asses, 1 mule—92 per cent of horses, 40 per cent of asses, and 100 per cent of mules.

AURANGPUR, NANGALA, AND DADRI.
Lingard, 1895, p. 2: 15 ponies died.

BAREILLY.
Lingard, 1895, p. 1: One outbreak occurred, in which all animals affected were either killed or died of the disease.

BAREILLY AND RÁNIKHET.
Lingard, 1895, p. 1: Government commissariat department lost 100 mules in October.
Lingard, 1895, p. 1: Bombay mounted police lost 11 horses.

GUJRANWALA TEHSIL, GUJRANWALA DISTRICT.
Lingard, 1898a, p. 8: 23 horses and 21 asses died.

JAGADHERI TEHSIL, UMBALLA DISTRICT.
Lingard, 1898a, p. 9: 17 asses died — 76 per cent.

KATGODAM–NAINI TAL TONGA SERVICE.

Lingard, 1895, p. 1: Lost 67 animals out of 128.

PÁLI.

Lingard, 1895, p. 1: 50 brood mares and young stock belonging to Mahárájah Sir Pertáb Singh died.

1894–1895.

DELHI.

Lingard, 1895, p. 2: An outbreak occurred among cavalry horses.

GUJERÁT, AHMEDABAD, BARODA, ETC.

Lingard, 1895, p. 1: A very severe and widespread outbreak involving an area of 400 square miles.

HOSHIARPUR DISTRICT.

Lingard, 1898a, p. 9: 61 horses and 32 asses died—82 per cent of horses and 64 per cent of asses.

LAHORE TEHSIL, LAHORE DISTRICT.

Lingard, 1898a, p. 8: 24 horses and 22 asses died.

PANIPAT TEHSIL, KARNAL DISTRICT.

Lingard, 1898a, p. 9: 28 horses died.

1895.

CHUNIAN TEHSIL, LAHORE DISTRICT.

Lingard, 1898a, p. 8: 12 horses died.

JAGADHERI TEHSIL, UMBALLA DISTRICT.

Lingard, 1898a, p. 9: 80 per cent of horses, 100 per cent of asses and mules died.

JAGRAON TEHSIL, LUDHIANA DISTRICT.

Lingard, 1898a, p. 9: In the village of Man 42 camels died.

KARNAL TEHSIL, KARNAL DISTRICT.

Lingard, 1898a, p. 9: 24 horses, 20 asses, and 15 mules.

KHANGAH TEHSIL, GUJRANWALA DISTRICT.

Lingard, 1898a, p. 8: 2 asses only.

LODHRIAN TEHSIL, MOOLTAN DISTRICT.

Lingard, 1898a, p. 8: 24 horses died—64 per cent.

MUKTSAR TEHSIL, FEROZEPUR DISTRICT.

Lingard, 1898a, p. 8: 8 horses died.

NAWASHAHAR TEHSIL (July to August).

Lingard, 1899, p. 9: In two villages, 8 horses and 20 asses died out of 21 and 27 animals, respectively.

PESHAWAR TEHSIL, PESHAWA DISTRICT.

Lingard, 1898a, p. 8: 3 horses died—16 per cent of the animals.

PIPLI TEHSIL, UMBALLA DISTRICT.

Lingard, 1898a, p. 9: Surra occurred in Radour, but losses were not heavy.

UMBALLA TEHSIL, UMBALLA DISTRICT.

Lingard, 1898a, p. 9: 25 asses died—20 per cent.

1895–1896.

JAGRAON TEHSIL, LUDHIANA DISTRICT.

Lingard, 1898a, p. 9: 38 horses and 14 asses died.

KAITHAL TEHSIL, KARNAL DISTRICT.

Lingard, 1898a, p. 9: 9 horses and 71 asses died.

1896.

BURMAH.

Lingard, 1898a, pp. 12–16: Vet. Capt. George H. Evans reports an outbreak among military and police ponies at Mandalay, and records 2 deaths from surra and 14 killed on account of the disease; also 22 mules destroyed.

KATGODAM, NAINI TAL DISTRICT.

Lingard, 1898a, p. 10: 32 horses died between July 1 and September 4.

KHANGAH TEHSIL, GUJRANWALA DISTRICT.

Lingard, 1898a, p. 8: 9 villages suffered loss from surra; 1 animal died in March, the others (?) during August, September, and October.

PIND DADAN KHAN TEHSIL, JHELUM DISTRICT.

Lingard, 1898a, p. 8: 5 animals died.

PIPLI TEHSIL, UMBALLA DISTRICT.

Lingard, 1898a, p. 9: "Chibha" suffered somewhat from the disease.

1896–1897.

BOMBAY. BOMBAY PRESIDENCY.

Lingard, 1898a, p. 11: 20 horses died.

GURDASPUR DISTRICT.

Lingard, 1898a, p. 9: Losses very small.

JABBALPUR, CENTRAL PROVINCES.

Lingard, 1898a, p. 11: 23 horses in all died of surra up to February 17, 1897.

LETHALITY OF SURRA.

Nearly all authors agree that surra in equines and camels is "invariably fatal." Thus, Griffith Evans (1881, p. 3) says that weak animals succumb soonest; (p. 7) records of the Fourth Punjab Cavalry show that no cases on the sick list ever recover; a few cases are said to have made slow progress in the disease, alternately better and worse for over a year; but they all eventually succumbed. Burke (1888a, p. 9) refers to surra as "extremely fatal," and (p. 85) quotes Steel as describing it as "invariably fatal;" later Burke (1891, p. 268) says that there is probably no disease in which the fatality is so high as in "pernicious anemia" (which he identifies with surra). Ranking (1891a, p. 399) also designates surra as "invariably fatal," and Lingard (1893, p. 79) says that surra in equines is "always fatal in the horse, mule, and camel, but in the bovine species after a period, during which the animal suffers from fever, and the infusorian is present in varying numbers in the blood, the animal generally returns to a normal state of health." (See also, 1899, pp. 80–88.) Pease (1897, p. 551) claims to have seen thousands of cases, but he never saw one recover spontaneously; "surra is invariably fatal;" (p. 556) in camels it runs a slow course, nevertheless, in the end the camel dies of surra, sometimes after so long a period as two or even three years; he (pp. 557–558) has seen all the dogs of a village swept off by this malady after eating surra carcasses. Cats also take the disease in the same way. Hayes (1898, p. 481) agrees that surra is "invariably fatal" unless treated with arsenic. Burke (1897, p. 192), on the other hand, states that if surra is treated with quinine, arsenic, iron, and other tonics, by changing the water and making some variation in the location of the animals, great benefit and even absolute removal of the disease may be secured.

(See also "Treatment," p. 91.)

IMMUNITY TO SURRA.

In 1893, Lingard (p. 7) stated that death follows the first attack in all the animals discussed, with the exception of the bovine species, and that his experiments tended to prove that one attack may grant immunity to this animal, at all events for a considerable period. It was later shown by Lingard (1895, p. 7) and others that one attack does not render an animal immune. He gives the following case:

> "An Australian gelding, the subject of surra in December, 1893, was cured of this disease by the administration of arsenic and iodide of arsenic and mercury.
>
> "Between March and October, 1894, the animal gained 235.75 pounds in weight, and was in a perfect state of health and condition. Fifteen months after the date of the previous attack, and 12 months after the cure was effected, the animal was inoculated with a minute drop of surra blood—a mere trace of soiled blood being smeared over a scratch on the muzzle—in order to ascertain whether any immunity had been conferred by the previous attack. The latent period of the second attack occupied 7 days. The progress of the disease was marked, as usual, by paroxysms of fever and intermissions, the former occupying a much more prolonged period (22 days), and the latter being shorter than usual (only 2 days).
>
> "Death took place on the fifty-third day of the disease, clearly proving that one attack of surra is unable to protect against a second attack."

Quite recently, Lingard (1901, p. 3) states that he has worked out a serum which has been found to possess immunizing power, but difficulty has been experienced in preserving its destructive power for any length of time. He does not state how this serum is obtained, but says that his experiments will be continued.

CAUSE OF SURRA.

Zoological position of the parasite Trypanosoma Evansi.

The parasite in question belongs to the Protozoa, class Mastigophora, subclass Flagellata, order Monadida, family Trypanosomidæ, genus *Trypanosoma*, species *Trypanosoma Evansi.* The characters of these groups may be seen from the following diagnoses and keys:

CLASS MASTIGOPHORA BÜTSCHLI.

CLASS DIAGNOSIS.—Protozoa: Microscopic organisms, whose bodies usually have a definite form but are not always provided with a cell membrane; cilia are absent, but the adult stage possesses one or several flagella; mouth present or absent; usually only one nucleus present, but never a paranucleus, and usually one or several pulsating vacuoles; reproduction by division, with or without conjugation and encystation.

The systematic position and the limits of this class are debatable questions. They may be placed under the rhizopods or near the ciliates. Some of the forms which certain authors admit to the class as animals other authors place among the plants. Some forms described or identified as flagellates may perhaps be only developmental stages in the life cycle of other animals. Flagellate stages occur, for instance, in the life cycle of some of the Mycetozoa and Sporozoa. Some of the flagellates described as parasitic are considered by certain authors as pathogenic, by other authors as harmless messmates. Quite a number of generic names have been used to designate the forms reported for man, but many of them will undoubtedly fall as synonyms. Numerous species are likely to be swallowed in drinking water. Under existing circumstances, the physician will do well to exercise considerable reserve in dealing with flagellated organisms; otherwise he may be led to erroneous conclusions.

In general, but especially in reference to the lower forms, it may be said that the protoplasm is quite homogeneous; a nearly fluid endoplasm may be recognized surrounded by a peripheral ectoplasm, the latter in turn may be bounded by a more dense layer, like a delicate cell membrane. These three divisions are, however, not always very distinct, but grade almost imperceptibly into one another. The pharynx is a very superficial infundibulum; a permanent anus appears to be absent, but the excreta appear to be expelled from a less resistant point at the posterior extremity, without, however, leaving any trace of their passage. The flagellum represents an organ of locomotion, and there may be one or more present. The pulsating vacuole is near the surface, but does not appear to possess either a distinct membrane or a permanent pore. The nucleus is rounded and appears to be provided with a nuclear membrane and a nucleolus. If conditions become unfavorable, as when the medium becomes too condensed by evaporation or too toxic by extreme putrefaction, the flagellate may discard its flagellum, become round, and form a surrounding cyst membrane; upon return of favorable conditions, it may escape from the cyst and, forming a new flagellum, recommence its active life; or it may divide during the encystment. The division of the free form in multiplying is usually longitudinal. In some cases, the organism encysts before dividing, then by longitudinal division two organisms are formed; the latter may then escape, form their flagella, and become active; or each daughter organism may reencyst and divide further; or the mother flagellate, when encysted, may divide into a large number of so-called "spores," each of which, upon escaping, forms its flagellum. There may also be a complete conjugation of two individuals, followed by encystment and division into numerous young.

It should be further remarked that, while some species are exceedingly simple in structure, as described above, other species are much more complicated and give rise to more or less complex colonies. For these forms, which have not yet been shown to have any particular medical bearing, the reader is referred to the writings of Kent, Bütschli, Delage, Calkins, and others.

Authors are not united upon the subdivisions of this class. Some writers admit three subclasses, others admit four, still others admit five. The following key will aid in determining at least three subclasses which are recognized by most authors:

KEY TO THE SUBCLASSES OF THE MASTIGOPHORA.

1. Protoplasm of body not reticulate 2
Protoplasm reticulate or branched; one flagellum (feeler) present; a firm membrane present; marine organisms of considerable size..........Cystoflagellata.
2. Shell usually has two grooves or furrows, one running around the body, the other longitudinally; marine and fresh-water forms..................Dinoflagellata.
The grooves or furrows are absent ....Flagellata.

SUBCLASS FLAGELLATA.

SUBCLASS DIAGNOSIS.—Mastigophora: Small organisms, usually with a sharply defined, mononucleate body, with a definite anterior end bearing one or more flagella; actively motile during life, but possessing power of encystment; reproduction by longitudinal division, in free or encysted stage.

The Flagellata represent the only subclass of Mastigophora which at present comes into consideration as parasites. Owing to the minuteness of the objects, hence the difficulty of recognizing characters for classification, there is a wide difference of opinion among authors relative to the subdivision of the subclass into orders, families, genera, and species.

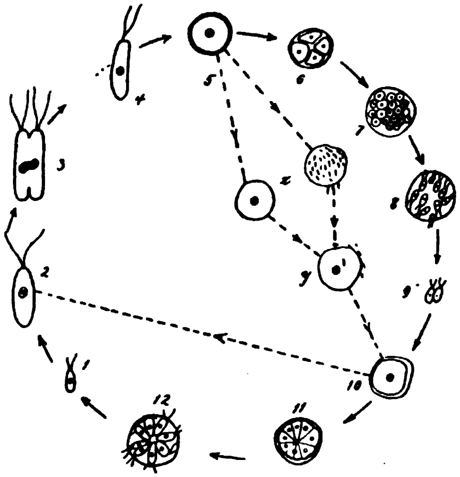

FIG. 1.—Diagram of variations in life cycle of flagellates: 1, a young flagellate; 2, adult flagellate; 3, longitudinal division of adult free form; 4, daughter flagellate; 5, encystation; 6–8, division into isogametes; *x*, division into macrogametes and microgametes, characteristic for some forms; 9, conjugation of the isogametes; *y*, conjugation of the micro- and macro-gametes; 10, resting stage—zygote; 11–12, division into young. (After Doflein, 1901, p. 53, fig. 29.)

ORDER MONADIDA.

ORDINAL DIAGNOSIS.—Flagellata: Independently living organisms, but in some cases forming colonies; arrangement of the flagella varies: 1 flagellum, usually anterior, or 2 equal flagella, or 2 unequal flagella, or 1 large and 2 small flagella; undulating membrane may be present.

FAMILY TRYPANOSOMIDÆ DOFLEIN, 1901.

FAMILY DIAGNOSIS.—Flagellata: Parasitic forms with one chief flagellum directed anteriorly; in some forms a secondary flagellum directed posteriorly; body usually with two angles, and wound more or less in the form of a spiral; one angle of body provided with an undulating membrane. One nucleus and one centrosome present.

TYPE GENUS.—*Trypanosoma.*

The family at present contains two genera, which are distinguished as follows:

One flagellum present, extending from the centrosome along the undulating membrane and becoming free at the anterior extremity..............*Trypanosoma*, p. 32.
Two flagella, one extending anteriorly, the other posteriorly..*Trypanoplasma*, p. 42.

Genus Trypanosoma[*] *Gruby, 1843.*

GENERIC DIAGNOSIS.—Trypanosomidæ: Body fusiform, presenting a lateral longitudinal undulating membrane, the thickened border of which terminates posteriorly, in the posterior half of the body, in a "centrosome," and is prolonged anteriorly in a free major flagellum; nucleus generally anterior; there is a tendency to agglomeration by the posterior extremity; division longitudinal and unequal. Parasitic in blood of vertebrates.

TYPE SPECIES.—*Trypanosoma rotatorium.*

Doflein divides this genus into three subgenera, as follows:

1. Major flagellum present .... 2.
Major flagellum absent, or very short and thick .... *Trypanosoma.*
2. Undulating membrane continued posteriorly in a flagellum, so that 2 flagella are present .... *Trypanomonas.*
Posterior flagellum absent, undulating membrane ending on or before end of body .... *Herpetosoma.*

From our present knowledge this division is not free from objection. Doflein is in error in selecting two of his names: *Trypanosoma* would, of course, remain the subgeneric name for the group containing *Tr. rotatorium.* If *Tr. Evansi* were recognized as belonging to a distinct subgenus, *Herpetosoma* Doflein, 1893, would have to be rejected in favor of *Hæmatomonas* Mitrophanow, 1883, as Doflein includes both *Tr. cobitis* and *Tr. carassii* in *Herpetosoma.* Laveran & Mesnil, however, have shown that *Tr. rotatorium* presents the same characters as the other trypanosomes, and a division of these forms into subgenera hardly seems justified. *Trypanomonas* Danilewsky, 1885, can not possibly take *Tr. Danilevskyi* as type, unless all of Danilewsky's names are rejected, and the subgenus is attributed to Labbé, 1891. *Trypanomonas* was based upon structures interpreted as young stages named *Trypanomonas ranarum*=*Trypanosoma rotatorium*, hence takes this species as its type, and thus becomes a synonym of *Trypanosoma* (*Trypanosoma*). Laveran & Mesnil, 1901g, have now separated "*Trypanosoma* (*Trypanomonas*)" of Doflein as a distinct genus, *Trypanoplasma*, with *Trypanoplasma Borreli* as type species.

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[*] SYNONYMS.—Under *Amœba* Mayer, 1843 [not *Amœba* Ehrenberg]; *Trypanosoma* Gruby, 1843 (type, *Tr. sanguinis*=*rotatorium*); *Monas* Lieberkühn; *? Globularia* Wedl, 1850 [not Swains., 1840, mollusk]; *Undulina* Ray Lankester, 1871 (type, *U. ranarum* =*Trypanosoma rotatorium*); *Herpetomonas* Kent, 1880 [only in part, as the type is *H. muscæ-domesticæ*]; *Paramecioides* Grassi, 1881 (type, *P. costatus*=*Trypanosoma rotatorium*); "*Tripanosoma* of Gruby" of Lanessan, 1882, and Balbiani, 1888; *Hæmatomonas* Mitrophanow, 1883 (type, *H. cobitis*); *Trypanomonas* Danilewsky, 1885 (type, *Trypanomonas ranarum*=*Trypanosoma rotatorium*); "*Spirochæte* of Steel, 1885" [quoted also as *Spirochetæ* and *Spirochæta*]; "*Hemotomonas*" of Blanchard, 1888; "*Trichomonas sanguinis*" of Crookshank, 1886, as "subgenus;" "*Triponomonas* Crookshank" of Balbiani, 1888, p. 399 [probably a typographic error *o* for *a*, and confusion between *Trypanomonas* Danilewsky and *Trichomonas*]; "*Trypanosomes* Gruby" of Laveran, 1895; *Trypanosomum* Chauvrat, 1896; "*Trypanosome* Grüby" of Buffard & Schneider, 1900; "*Paramœcioides* Grassi, 1882" of Laveran & Mesnil, 1901; "*Tryanosoma* Doflein, 1901," typographical error for *Trypanosoma.*

Description of Plate I.

Figs. 21–29.—Reproduction of *Trypanosoma Lewisi* in the rat. X about 2,000 diameters. (After Laveran & Mesnil, 1901e, pl. 11, figs. 1–9.)

Fig. 21.—Slender adult form.

Fig. 22.—Swollen form preparing to divide.

Fig. 23.—Division of the centrosome and of the base of the flagellum.

Fig. 24.—The division into two organisms is almost accomplished; one of the two individuals bears the old flagellum, the other a newly formed short flagellum.

Fig. 25.—Stage of multiplication with 4 elements, 3 have new flagella, the fourth bears the old flagellum.

Fig. 26.—Stage of multiplication of the nucleus and of the centrosome, not yet accompanied by the division of the protoplasm; one of the flagella is larger than the others.

Fig. 27.—Complete rose cluster of 10 small elements on the point of separating.

Fig. 28.—Free young form.

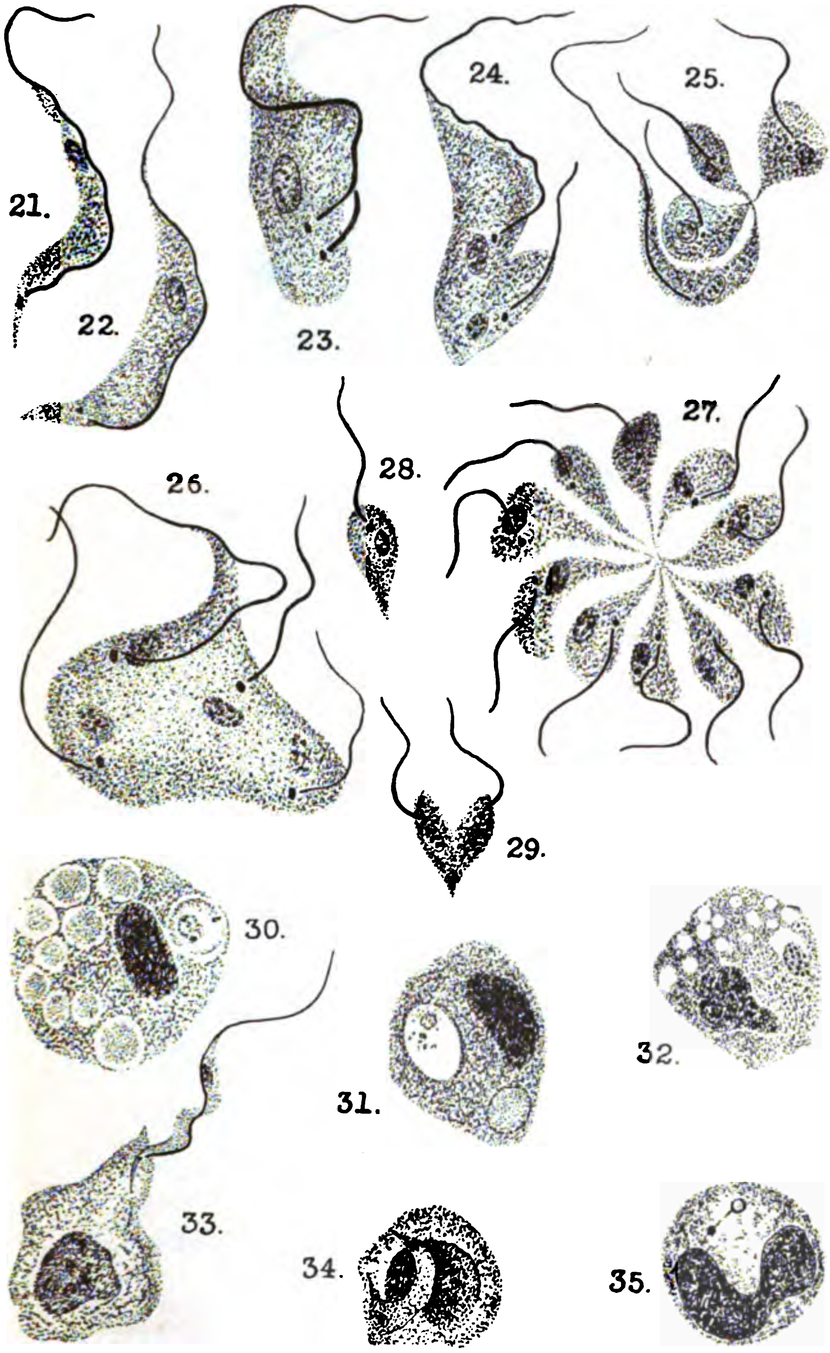
Fig. 29.—Young form in the act of dividing.

Fig. 30–35.—Ingestion of the trypanosoma by phagocytes. X about 1,100 diameters. (After Laveran & Mesnil, 1901e, pl. 11, figs. 10–15.)

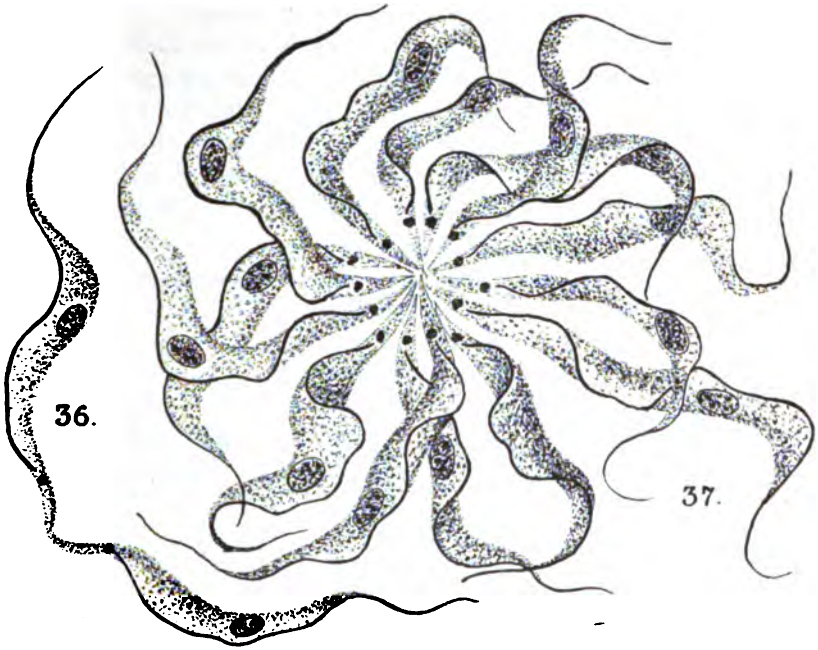
Figs. 30–32.—Three phases of the digestion of trypanosoma by mononuclear leucocytes of the peritoneal exudate of a guinea pig; two of these leucocytes have also swallowed blood corpuscles.

Figs. 33–34.—Two phases of indigestion of trypanosoma by leucocytes of the peritoneal exudate of a rat having active immunity.

Fig. 35.—Chromatic mass in a leucocyte of a rat; passive immunity.



REPRODUCTION OF TRYPANOSOMA LEWISI IN THE RAT.



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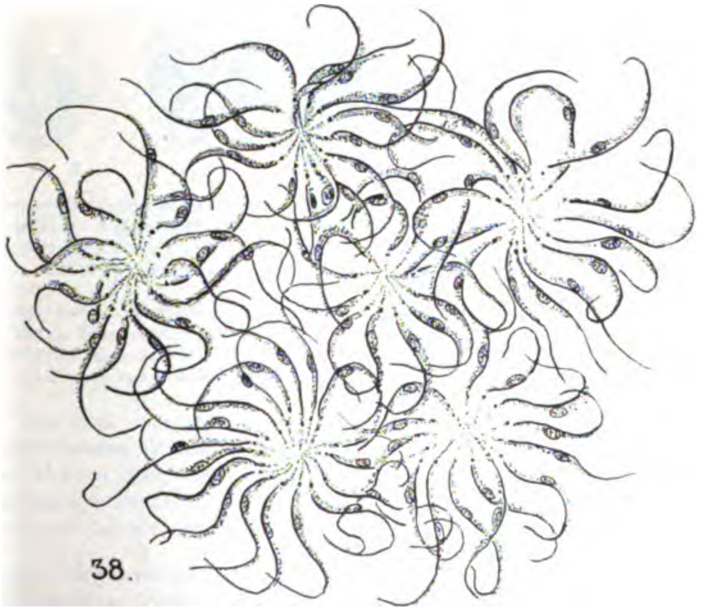

38.

TRYPANOSOMA LEWISI OF RAT TRYPANOSOMIASIS.

Fig. 36, Union of two trypanosomes; fig. 37, primary agglomeration in a rose cluster; fig. 38, secondary agglomeration.

The genus *Trypanosoma* has proved to be very important from the standpoints of comparative medicine and national economics, but its relation to human medicine is at present problematic.

Rats and frogs are the most convenient hosts from which to collect trypanosomes for study. There is quite an extensive literature on the group, the more recent articles containing both bibliographies and technique. The nomenclature, in part at least, does not appear to be firmly established. The following are the best known species:

A. TRYPANOSOMA OF MAMMALS.

Trypanosoma Lewisi[a] (Kent, 1880) of rat trypanosomiasis.

(Figures 2-42.)

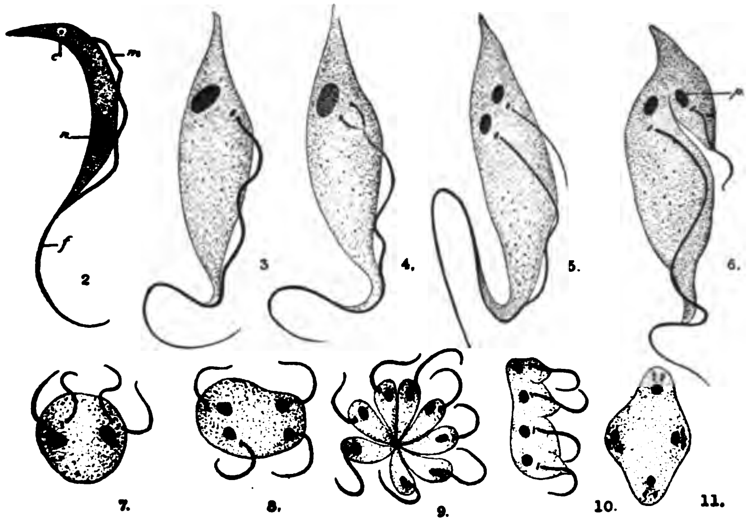

FIG. 2.—*Trypanosoma Lewisi*, completely developed; *n*, nucleus; *c*, centrosome; *m*, undulating membrane; *f*, flagellum. X about 2,000 diameters. (After Laveran & Mesnil, 1901e, p. 686, fig. 1.)

FIGS. 3-6.—*Trypanosoma Lewisi*, in process of division; fig. 6 shows a small trypanosoma on the point of separating from the mother parasite. X about 2,000 diameters. (After Laveran & Mesnil, 1901e, p. 686, figs. 2-5.)

FIGS. 7-10.—Other forms of multiplication of *Trypanosoma Lewisi*. X about 2,000 diameters. (After Laveran & Mesnil, 1901e, p. 686, figs. 6-9.)

FIG. 11.—Multiplying stage, insufficiently stained, so that the flagella are not visible. X about 2,000 diameters. (After Laveran & Mesnil, 1901e, p. 686, fig. 10.)

SPECIFIC DIAGNOSIS.—*Trypanosoma:* 8 to 10μ long, 2 to 3μ broad; 24 to 25μ long by 1.4μ broad (Laveran & Mesnil, 1901); a very refringent granule (near centrosome) in place of which a clear vacuole is seen in stained preparations. "Animalcules exceedingly minute, attenuate and vermicular under normal conditions, but highly polymorphic and capable of assuming a variety of contours; flagellum single, terminal, two or three times the length of the extended body; no contractile vesicle * * * as yet detected."

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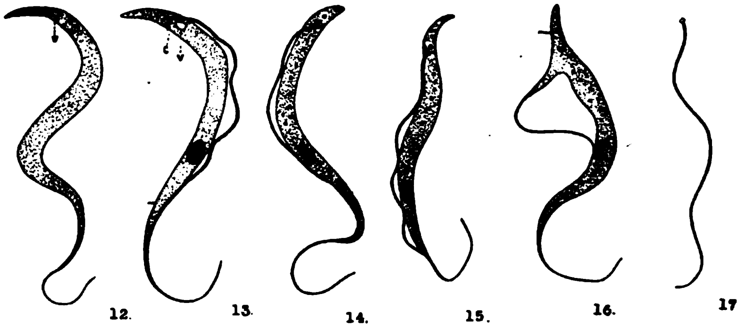
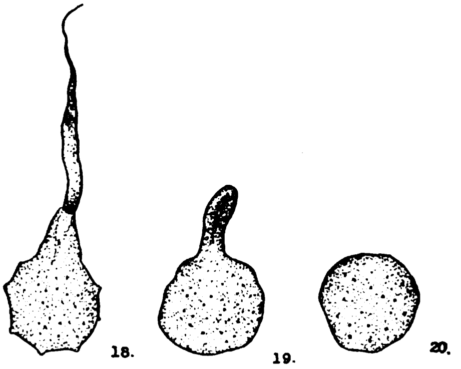
[a] SYNONYMS.—*Herpetomonas Lewisi* Kent, 1880; "*Herpomonas Lewisi* (Kent)," 1880 (lapsus); *Trichomonas Lewisi* (Kent) Crookshank, 1886; *Herpetomonas Lewisii* Danilewsky, 1889; *Trypanomonas murium* Danilewsky, 1889; *Trypanomonas Lewisi* (Kent) Labbé, 1891; *Trypanosoma Lewisi* (Kent); *Trypanosoma sanguinis* Kanthack, Durham & Blandford, 1898 (not Gruby, 1843); *Trypanosoma rattorum* Börner, 1901; *Trypanosoma* (*Herpetosoma*) *Lewisi* (Kent) Doflein, 1901.

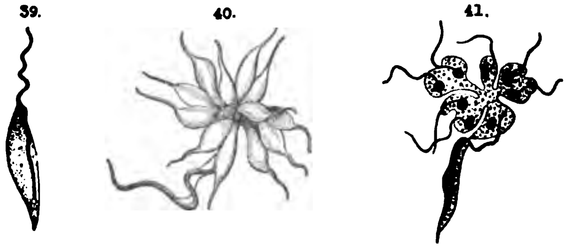
HABITAT.—Blood of rats (*Mus rattus*, *M. decumanus*, *M. rufescens*) and hamster



FIGS. 12-17.—Involution forms of *Trypanosoma Lewisi:* Fig. 12, trypanosoma in fresh blood of the guinea pig; fig. 13, trypanosoma in a colored preparation of guinea pig's blood; *c*, centrosome; *v*, vacuole; figs. 14, 15, trypanosomes colored after being twenty days in the refrigerator; fig. 16, deformed trypanosome, after 9 days in a hanging drop (blood and serum of chicken); fig. 17, centrosome and flagellum, in a colored preparation. (After Laveran & Mesnil, 1901e, p. 688, figs. 11-16.)



FIGS. 18-20.—Leucocyte in the peritoneal exudate of a rat, feeding upon a trypanosome, four hours after the intraperitoneal injection of trypanosomatic blood: Fig. 18, movements of trypanosome are distinct, but somewhat slower; fig. 19, five minutes later; fig. 20, five minutes still later. (After Laveran & Mesnil, 1901e, p. 706, fig. 17.)



FIGS. 39-41.—*Trypanosoma Lewisi:* Fig. 39, simple organism; fig. 40, mass resulting from division, drawn from living specimen; fig. 41, the same, from prepared specimen. (After Senn & Wasielewsky [copied from Doflein, 1901, p. 62, fig. 36].)

(*Cricetus arvalis*). Fleas, and perhaps lice also, may transmit it from animal to animal.

LITERATURE.—See especially Lingard's various papers, and Laveran & Mesnil, 1901e, pp. 673-714; Rabinowitsch & Kempner, 1899, pp. 251-294. (See also p. 125.)

There is some doubt as to whether the parasite found in the hamster is identical with that of the rat. Trypanosomes are also reported for other rodents (bandicoots, rabbits, spermophiles, and guinea pigs), but the descriptions are not such that they can be classified with certainty.

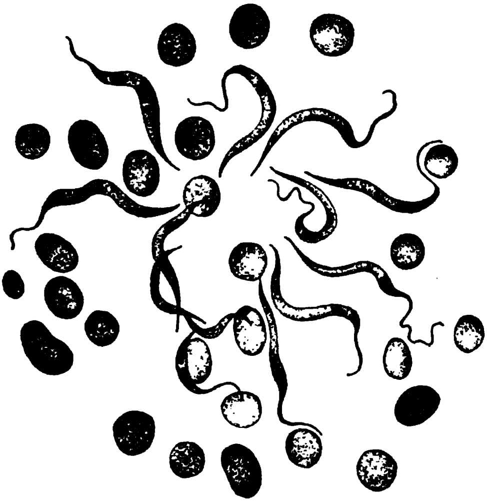


FIG. 42.—*Trypanosoma Lewisi* in rat's blood. "Dissolution of a rosette, with radially arranged developed young." (After Rabinowitsch & Kempner, 1899, pl. 3, fig. 27.)

Trypanosoma Evansi[a] **(Steel, 1885) of surra (horses, etc.).**

(Figure 43.)

SPECIFIC DIAGNOSIS.—*Trypanosoma:* 20 to 30 μ long, 1 to 2 μ broad.

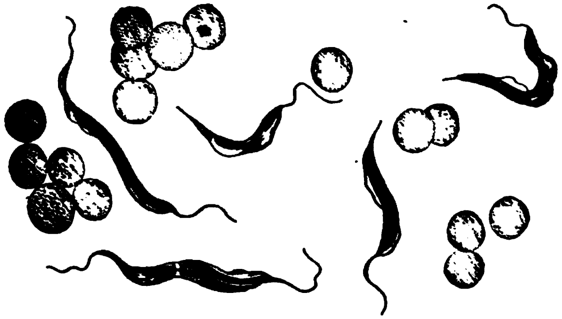


FIG. 43.—*Trypanosoma Evansi:* Two specimens are dividing. × 1,200. (After Evans, in Crookshank, 1886, p. 918, fig. 193.)

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[a] SYNONYMS.—[Genus not named] *ferox* Evans, 1881 [not entitled to priority]; *Spirochæte Evansi* Steel [not accessible]; "*Spirochæta Evansi* Steel," 1885, of Crookshank, 1886; *Hæmatomonas Evansi* (Steel) Crookshank, 1886; *Trichomonas Evansi* (Steel) Crookshank, 1886; *Hemotomonas Evansis* Blanchard, 1888; "*Trichomonas sanguinis* Crookshank" of Balbiani, 1888, p. 399, and Veterinarian, London, 1890, p. 2; "*Spirochetæ Evansii*" of Nariman & Vaz, 1893; "*Spirochæta Evansii* (Steel)" of Laveran, 1895; *Trypanosomum Evansi* (Steel) Chauvrat, 1896; *Trypanosoma Evansi* (Steel) Pease, 1897; *Trypanosoma Evansii* Pease, 1897; *Herpetomonas Lewisii* (Steel) of Danilewsky, 1889; *Trypanosoma* (*Herpetosoma*) *Evansi* (Steel) Doflein, 1901; "*Trichomonas sanguinis Evansi* Crookshank" of Doflein, 1901.

HABITAT.—Blood of horses, mules, camels, and elephants in India; transmissible to cattle, buffaloes, sheep, goats, rabbits, guinea pigs, rats, dogs, cats, and monkeys. Surra may be transmitted by flies.

Trypanosoma Brucii[a] Plimmer & Bradford, 1899, of tsetse disease (horses, etc.).

(Figures 44–49.)

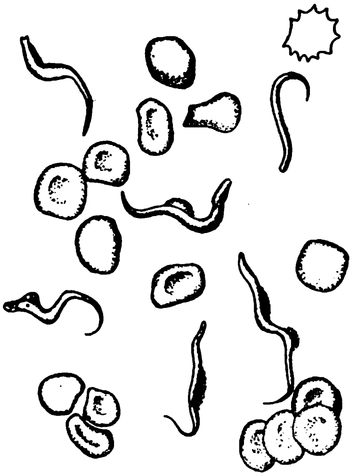

FIG. 44.—*Trypanosoma Brucii* among blood corpuscles. (After Koch, 1898, p. 66, fig. 1.)

SPECIFIC DIAGNOSIS.—*Trypanosoma:* 25 to 30 μ long, 1.5 to 2.5 μ broad. As compared with *Tr. Lewisi* the posterior extremity of *Tr. Brucii* is not so sharp, the undulating membrane is broader and more plicate, the protoplasm colors more easily and more deeply, and movements are less active. The protoplasm contains granules, which accumulate principally in anterior half, some of which are as large as the centrosome, and they color the same as the centrosome; centrosome divides before the nucleus.

HABITAT.—In blood of African horses, mules, asses, cattle, buffaloes, antelopes, camels, hyenas, and dogs; transmissible to cats, rats, mice, and rabbits, hedgehog, donkey, bosch-bok, hybrid of zebra ♂ × horse ♀, horse ♂ × zebra ♀, ass ♂ × zebra ♀, guinea pigs, goats, sheep, monkey (*Macacus rhesus*), and weasel; cause of nagana, or tsetse-fly disease, and transmitted from animal to animal by the tsetse fly (*Glossina morsitans*). (See also p. 110.)

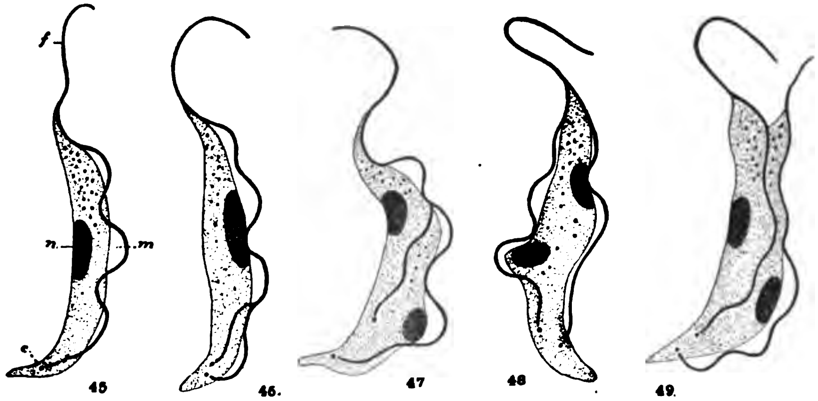

FIG. 45.—*Trypanosoma Brucii: c*, centrosome; *f*, flagellum; *m*, undulating membrane; *n*, nucleus. × about 2,000. (After Laveran & Mesnil, 1901a, p. 327, fig. 1.)

FIG. 46.—The same, beginning to divide; two centrosomes are present, and the flagellum is now dividing. (After Laveran & Mesnil, 1901a, p. 327, fig. 2.)

FIGS. 47–49.—Further stages of division. (After Laveran & Mesnil, 1901a, p. 327, figs. 3–5.)

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[a] SYNONYMS.—*Trypanosoma Brucii* Plimmer & Bradford, 1899; "*Trypanosoma Brucei*" of Schneider & Buffard, 1900; *Trypanosoma* (*Herpetosoma*) *Brucei* Plimmer & Bradford, of Doflein, 1901, p. 64; *Herpetomonas Brucei* (Plimmer & Bradford) Laveran & Mesnil, 1901.

Trypanosoma equiperdum[a] Doflein, 1901, of dourine (horses, etc.).

(Figures 50–51.)

SPECIFIC DIAGNOSIS.—*Trypanosoma:* 18 to 26 μ long, 2 to 2.5 μ broad.

HABITAT.—Blood of horse and ass, and transmissible to dogs, rabbits, rats, and white mice. Considered the cause of dourine (maladie du coït; Beschälkrankheit), and transmissible by coitus; Algiers, France, and Spain. Nocard believes dourine is identical with surra and nagana, and doubts exist in the minds of some observers whether *Tr. equiperdum* is actually the cause of the disease.

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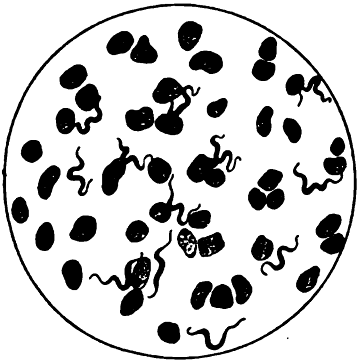

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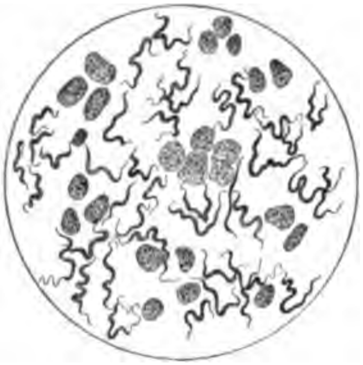

FIG. 50.—*Trypanosoma equiperdum* in blood of a rat, four days after infection. (After Rouget, 1896, p. 722, fig. 2.) FIG. 51.—The same, eight days after infection. (After Rouget, 1896, p. 722, fig. 3.)

Trypanosoma equinum[b] Voges, 1901, of mal de caderas (horses, etc.).

(Figure 52.)

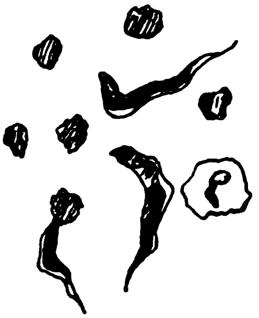

FIG. 52.—*Trypanosoma equinum.* (After Elmassian, 1901, p. 604.)

SPECIFIC DIAGNOSIS.—*Trypanosoma:* Length 3 to 4 times the diameter of a red corpuscle.

HABITAT.—Blood of horses, mules, asses, hogs, and water hogs; transmissible to white and gray rats and mice, rabbits, guinea pigs (rarely), dogs, goats, sheep, chickens, turkeys, ducks, monkeys (*Nyctipithecus felinus*), and other animals; South America.

Trypanosoma sp. of man.

Nepveu (1898) has reported the presence of *Trypanosoma* in man, but satisfactory details are lacking, and the British Medical Journal of January 4, 1902, publishes a short telegram from West Africa, reading: "*Trypanosoma*, European, peculiar symptoms. Dutton." Additional details of Dutton's case are reported in the British Medical Journal, January 11. Further than these three references, we are not acquainted with any original reports relative to trypanosomiasis in man.

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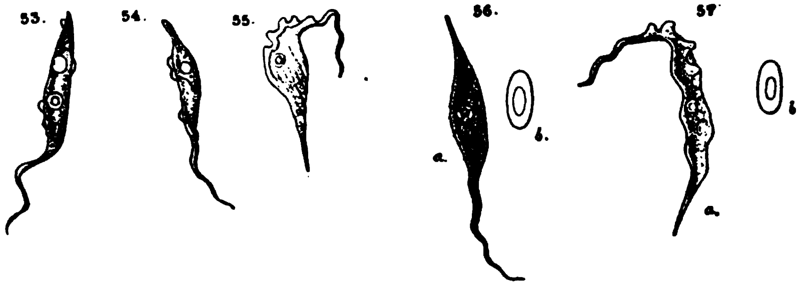
[a] SYNONYMS.—*Trypanosoma* (*Herpetosoma*) *equiperdum* Doflein, 1901, July 1; "*Tryanosoma*" (*Herpetosoma*) *equiperdum* Doflein, 1901 [misprint]; *Trypanosoma Rougeti* Laveran & Mesnil, 1901, July; *Trypanosoma* (*Hæmatomonas*) *equiperdum* Doflein of Lühe, 1902.

[b] SYNONYMS.—*Trypanosoma equina* Voges, 1901; *Trypanosoma equinum* Voges of Railliet, 1901.

B. TRYPANOSOMA OF BIRDS.

Trypanosoma avium[a] Danilewsky, 1885, of avian trypanosomiasis.

(Figures 53-64.)



FIGS. 53-54.—*Trypanosoma avium*, with posterior vacuoles; a nucleus with a halo can be very readily seen in fig. 53. (After Danilewsky, 1889a, pl. 2, figs. 32-33.)

FIG. 55.—A more rare form of *Trypanosoma avium* (with a pectinate surface—*Tr. costatum*). (After Danilewsky, 1889a, pl. 2, fig. 34.)

FIG. 56.—Large *Trypanosoma* (*Tr. major*). (After Danilewsky, 1889a, pl. 2, fig. 36.)

FIG. 57.—The same; entire body undulated. (After Danilewsky, 1889a, pl. 2, fig. 37.)

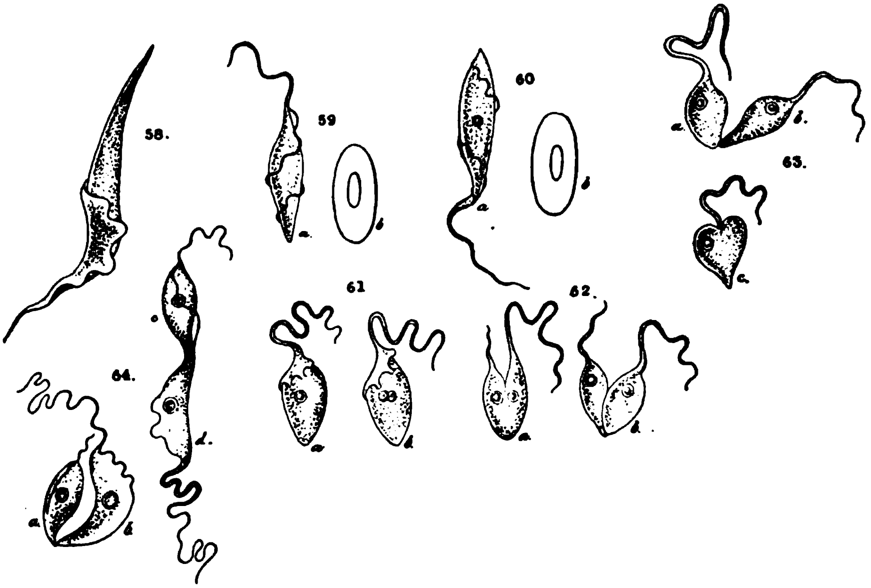


FIG. 58.—Large *Trypanosoma* (*Tr. major*), dead.

FIGS. 59-60.—Ordinary forms of *Trypanosoma avium*. (After Danilewsky, 1889, pl. 2, figs. 39-40.)

FIG. 61.—Fusiforme *Trypanosoma* of birds, before longitudinal division: the characteristic curves of the flagellum: *a*, retraction of the undulating membrane; *b*, division of the nucleus. (After Danilewsky, 1889, pl. 2, fig. 44.)

FIG. 62.—Continuation of 61: division in *a* and *b*: in *a* is formed a new flagellum which elongates rapidly. (After Danilewsky, 1889, pl. 2, fig. 45.)

FIG. 63.—Continuation of 62; division *a* and *b* almost complete; in *a* the mobile flagellum forms characteristic curves, which indicates that the division of the part (*a*) itself is about to take place; *c*, *a*, after the separation of *b*. (After Danilewsky, 1889, pl. 2, fig. 46.)

FIG. 64.—*a*, *b*, Specimens of two young *Trypanosoma avium* after longitudinal division: *a*, a thin hyaline border (which will undulate later), and a young flagellum; *b*, *a*, already an undulating mobile membrane; the undulations start from the root of the flagellum; *c*, *d*, the same *Trypanosoma*, only more developed. (After Danilewsky, 1889, pl. 3, fig. 69.)

SYNONYMS.—*Trypanosoma avium* Danilewsky, 1885; *Trypanosoma fusiforme* Dani-

SPECIFIC DIAGNOSIS.—*Trypanosoma:* 18 to 60 μ long; body cylindrical, compact, fusiform, and homogeneous; anterior extremity gradually attenuate, and continuing directly into a long or short flagellum; flagellum intimately united with undulating membrane, which extends from flagellum to posterior extremity; nucleus spherical in equator or anterior half of body.

HABITAT.—Blood of birds.

Danilewsky's use of technical names is so confusing and without system that it is often difficult to interpret his writings. Strictly speaking, he does not follow the Linnæan system, and it would perhaps be allowable, under the Code of Nomenclature, to ignore all of his technical names.

? Trypanosoma Eberthi Kent,[a] 1880.

(Figure 65.)

DIAGNOSIS.—*Trypanosoma:* "Body flattened, and semilunate when at rest, its convex membraniform border serrated or presenting a beaded aspect; straight, lanceolate, and pointed at each extremity when in motion, not produced at either end into a tag-like prolongation; the membranous border often spirally convolute around the thicker central portion, the entire body assuming under such conditions an auger-like aspect. Length 1–1760″." (Kent, 1880, pp. 219–220.)

HABITAT.—Cecum and ileum of chickens, ducks, geese, and ? pigeons.

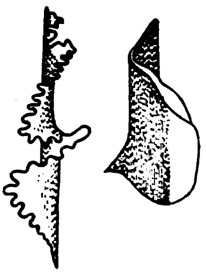


FIG. 65.—*Trypanosoma Eberthi.* (After Eberth [original not accessible, figure copied from Doflein, 1901, p. 59, fig. 33].)

As the genus *Trypanosoma* is composed chiefly of parasites which live in the blood, doubts arise in our minds as to whether this species is correctly classified.

C. TRYPANOSOMA OF AMPHIBIA.

Trypanosoma rotatorium[b] (Mayer, 1843) Laveran & Mesnil, 1901.

(Figures 66–70.)

SPECIFIC DIAGNOSIS.—*Trypanosoma:* 40 to 80 μ long by 5 to 10 μ broad; flagellum 10 to 12 μ. "Body compressed, semilunate, twisted; the convex border membranous and undulating; the posterior extremity of the body portion pointed and curved inward, the opposite one produced into a long tag- or tail-like appendage

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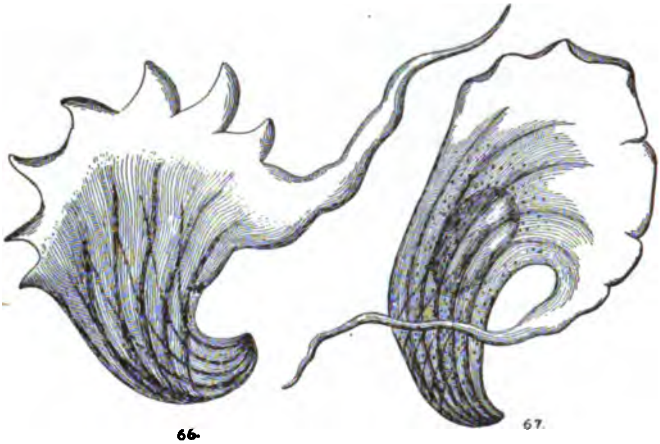
lewsky, 1889; *Trypanosoma minus* Danilewsky, 1889; *Trypanosoma majus* Danilewsky, 1889; *Trypanosoma sanguinis avium* Danilewsky, 1889; *Trypanosoma costatum* Danilewsky, 1889, at least in part; *Trypanosoma major* Danilewsky, 1889.

[a] SYNONYMS.—*Trypanosoma Eberthi* Kent, 1880; "*Tripanosoma Eberthi*" of Lanessan, 1882; *? Cercomonas gallinarum* Davaine, 1877; *? Cercomonas gallinæ* Rivolta, 1880; *Tripanosoma Eberthie* of Leclerq, 1890; *? Trichomonas columbarum* Kruse, 1896.

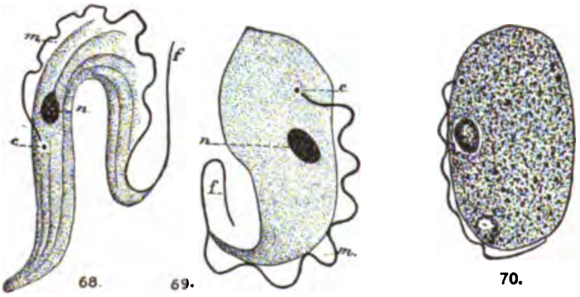
[b] SYNONYMS.—*Amœba rotatoria* Mayer, 1843, July; *Paramæcium loricatum* Mayer, 1843, July; *Paramæcium costatum* Mayer, 1843, July; *Trypanosoma sanguinis* Gruby, 1843, Nov.; *Globularia radiata sanguinis* Wedl, 1850; *Undulina ranarum* Lankester, 1871; *Paramecioides costatum* Grassi, 1881; *Paramecioides costatus* Grassi, 1883; "*Tripanosoma sanguinis* Gruby" of Lanessan, 1882; "*Globularia radiata* Wedl, 1849" of R. Blanchard, 1885; *Trypanomonas ranarum* Danilewsky, 1885; *Trypanosoma ranarum* Danilewsky, 1885; *Trypanosoma renarum* Danilewsky, 1889 [misprint for *ranarum*]; *Trypanosoma costatum* Danilewsky, 1889; *Trypanosoma costatum ranarum* Danilewsky, 1889, p. 61; *Trichomonas ranarum* (Lankester) Danilewsky, 1889; *Trichomonas batrachorum* Danilewsky, 1889; "*Paramoecium loricatum* + *costatum* Mayer" and "*Paramoecioides costatus* Grassi" of Laveran & Mesnil, 1901.

which almost equals in length the remainder of the body; surface of the body coarsely striate longitudinally; endoplasm or parenchyma slightly granular; endoplast ovate, central."

HABITAT.—Blood of frogs (*Rana temporaria*, *R. esculenta*, *Hyla arborea*).



FIGS. 66–67.—*Trypanosoma rotatorium.* (After Lankester, 1871, p. 388, figs. 1–2.)



FIGS. 68–70.—*Trypanosoma rotatorium* of the frog: Fig. 68, plaited form; fig. 69, flat form; *c*, centrosome; *f*, flagellum; *m*, undulating membrane; *n*, nucleus; fig. 70, retracted. X about 1,400 diameters. (After Laveran & Mesnil, 1901c, p. 680, figs. 1–3.)

D. TRYPANOSOMA OF FISH.

Trypanosoma cobitis [a] (Mitrophanow, 1883) of the mudfish.

(Figure 71.)

SPECIFIC DIAGNOSIS.—*Trypanosoma:* 30 to 40 μ long, 1 to 1.5 μ broad; flagellum 10 to 15 μ. "Body provided with a spiral membrane and a flagellum at the fore end. Parenchyma of body homogeneous. Second variety, body and flagellum only. Movement undulatory, body containing highly refractive spherules. Third variety, plasma-like body, without membrane or flagellum; quickly changes form by sending out processes laterally, and contains two to four refractive spherules." (Crookshank, 1886, pp. 921–922.)

HABITAT.—Blood of the mudfish (*Cobitis fossilis*).

---

[a] SYNONYMS.—*Hæmatomonas cobitis* Mitrophanow, 1883; *Trichomonas cobitis* (Mitrophanow) Crookshank, 1886; *Trypanosoma piscium* Danilewsky, 1885, in part; *Trypanosoma fusiforme piscium* Danilewsky, 1885, in part; *Trypanosoma* (*Herpetosoma*) *cobitis* (Mitrophanow) of Doflein, 1901; *Hæmatomonas cobitidis* Lühe, 1902.

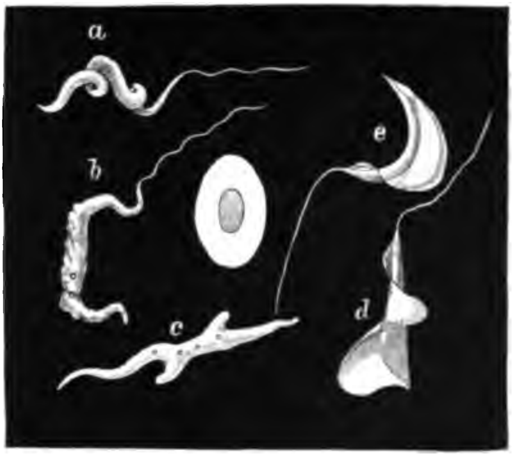


FIG. 71.—TRYPANOSOMA COBITIS IN THE BLOOD OF MUDFISH.

a, First variety; *b*, second variety; *c*, third variety; *d*, first variety in a state of diminished activity; *e*, the same after treatment with osmic acid. (After Mitrophanow, 1883, p. 41, fig. 1.)

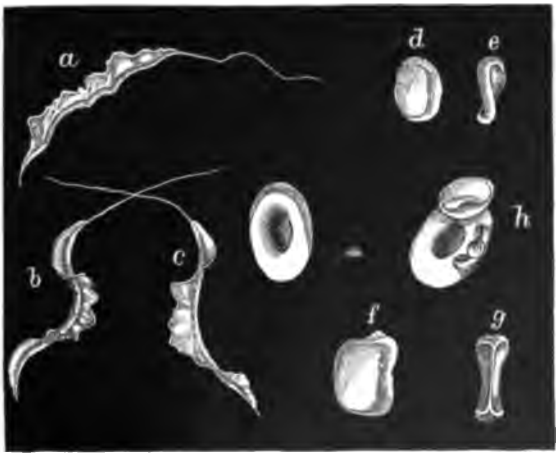


FIG. 72.—*a*, *b*, *c*, TRYPANOSOMA CARASSII IN THE BLOOD OF THE CARP; *d*, *e*, *f*, *g*, *h*, OTHER ORGANISMS IN THE SAME BLOOD.

(After Mitrophanow, 1883, p. 42, fig. 2.)

Trypanosoma carassii[a] (Mitrophanow, 1883).

(Figure 72.)

SPECIFIC DIAGNOSIS.—*Trypanosoma:* "Long bodies, with narrow membrane attached along the whole length; less actively motile. Several forms also observed strikingly smaller than the above; many disk-shaped. Often seen attached to a red corpuscle, setting them in motion by their movements." (Crookshank, 1886, p. 922.)

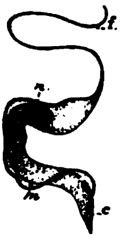
HABITAT.—Blood of fish (*Carassius vulgaris*).

Trypanosoma Remaki Laveran & Mesnil, 1901, of pike.

(Figures 73–74.)

SPECIFIC DIAGNOSIS.—*Trypanosoma:* Noticed in two forms, described as varieties as follows:

Trypanosoma Remaki parva Laveran & Mesnil, 1901: Very similar to *Tr. Lewisi;* 28 to 30 μ long, including flagellum which is about as long as the body; 1.40 μ broad; body pointed at both extremities, often more pointed anteriorly; protoplasm finely granular; nucleus round or oval, usually near border between anterior and middle thirds of body; "centrosome" small, spherical, near posterior extremity; undulating membrane slightly developed.



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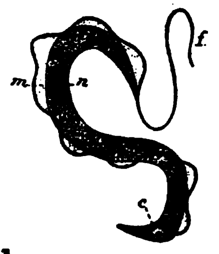

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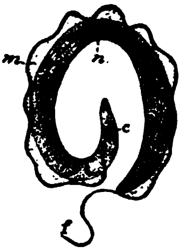

75.

FIG. 73.—*Trypanosoma Remaki parva;* c, centrosome; f, flagellum; m, undulating membrane; n, nucleus. X about 1,800. (After Laveran & Mesnil, 1901, p. 672, fig. 1.) FIG. 74.—*Trypanosoma Remaki magna.* (After Laveran & Mesnil, 1901, p. 672, fig. 2.) FIG. 75.—*Trypanosoma soleæ;* c, centrosome; f, flagellum; m, undulating membrane; n, nucleus. X about 1,800. (After Laveran & Mesnil, 1901, p. 672, fig. 3.)

Trypanosoma Remaki magna Laveran & Mesnil, 1901: 45 μ long, including flagellum, the body measuring 26 to 28 μ long, 2 to 2.5 μ broad; thicker than *Tr. Remaki parva* and colors more intensely.

HABITAT.—Blood of European pike (*Esox lucius*).

Trypanosoma soleæ Laveran & Mesnil, 1901, of soles.

(Figure 75.)

SPECIFIC DIAGNOSIS.—*Trypanosoma:* Body 32 μ long, flagellum 8 μ long; anterior extremity often less pointed than the posterior; oval nucleus, containing large granules of chromatin, situated near equator; "centrosome" spherical, larger than in *Trypanosoma Remaki*, and situated toward posterior extremity; undulating membrane well developed.

HABITAT.—In blood of soles (*Solea vulgaris*); France.

E. ? TRYPANOSOMA OF MOLLUSKS.

? Trypanosoma Balbianii[b] Certes, 1882, of oysters.

(Figures 76–81.)

SPECIFIC DIAGNOSIS.—*? Trypanosoma:* 50 to 18 μ long by 1 to 30 μ broad.

HABITAT.—Intestine of oysters (*Ostrea edulis, O. angulata, Gryphæa angulata*) and mussels (*Tapes decussata, T. pallustra*).

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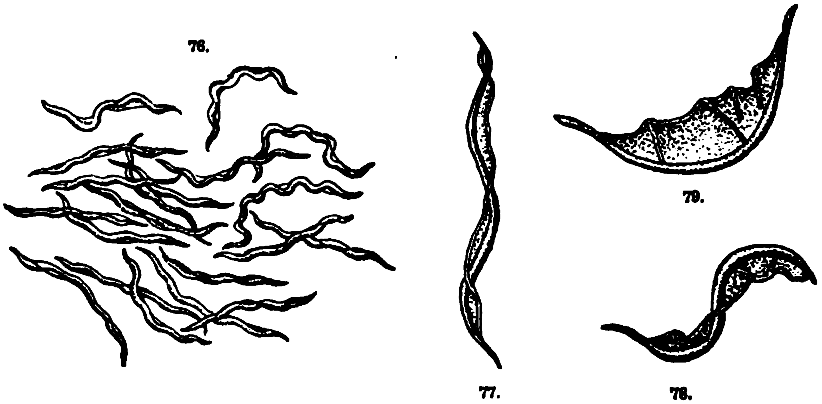
[a] SYNONYMS.—*Hæmatomonas carassii* Mitrophanow, 1883; *Trichomonas carassii* (Mitrophanow) Crookshank, 1886; *Trypanosoma piscium* Danilewsky, 1889, in part; *Trypanosoma fusiforme* Danilewsky, 1889, in part; *Trypanosoma* (*Herpetosoma*) *carassii* (Mitrophanow, 1883) Doflein, 1901, p. 71.

[b] SYNONYMS.—*Trypanosoma Balbianii* Certes, 1882; *Tripanosoma Balbianii* (Certes) Balbiani, 1888; "*Trypanosoma Balbiani*" of Danilewsky, 1889, p. 55.

According to recent investigations by Laveran & Mesnil (1901f), this parasite is not a member of the family Trypanosomidæ.



FIGS. 76–79.—*Trypanosoma Balbianii* Certes: Fig. 76, group of living individuals submitted to compression; X 250; retractile crest seen in a certain number of individuals; fig. 77, living individual compressed and colored by methylene blue; X 800; crest quite visible; figs. 78–79, individuals fixed by the vapors of osmic acid, and colored by methylene blue; X 800. (After Certes, 1882, pl. 7, figs. 1–4.)

Genus Trypanoplasma[a] *Laveran & Mesnil, 1901.*

GENERIC DIAGNOSIS.—Trypanosomidæ: Body elongate, provided with a longitudinal lateral membrane, and terminating at each end with a flagellum.

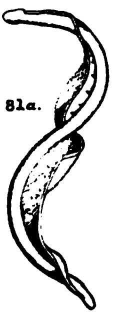
TYPE SPECIES.—*Trypanoplasma Borreli* Laveran & Mesnil, 1901.

Trypanoplasma Borreli Laveran & Mesnil, 1901.

(Figure 82.)

SPECIFIC DIAGNOSIS.—*Trypanoplasma:* 20 µ long (flagella not included), 3 to 4 µ broad; body flattened, often curved in an arch, concave side thicker than the convex side which bears the undulating membrane; anterior extremity pointed, posterior extremity rounded; at union of middle and posterior thirds of body are seen two masses of chromatin of about equal size and of elongate form, their long axis parallel with longitudinal axis of the body; the mass on the concave side of the body is interpreted as the nucleus, that on the

FIG. 80.—*Trypanosoma Balbianii.* (After Certes, 1891, p. 131.)



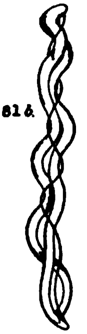


FIG. 81 *a.*—*Trypanosoma Balbianii.* (After Lustrac, 1896 [copied from Doflein, 1901, p. 60, fig. 34 a].)

FIG. 81 *b.*—The same, dividing. (After Lustrac, 1896 [copied from Doflein, 1901, p. 60, fig. 34 b].)

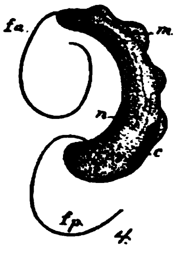


FIG. 82.—*Trypanoplasma Borreli; c,* centrosome; *fa,* anterior (major) flagellum; *fp,* posterior flagellum; *m,* undulating membrane; *n,* nucleus. X about 1,800. After Laveran & Mesnil, 1901, p. 672, fig. 4.)

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[a] SYNONYMS.—"*Trypanomonas* Danilewsky" of Labbé, 1891; "*Trypanosoma* (*Trypanomonas*)" of Doflein, 1901; *Trypanoplasma* Laveran & Mesnil, 1901.

convex surface as the "centrosome;" from the "centrosome" extend two flagella, one anteriorly, the other posteriorly; the anterior flagellum borders the undulating membrane, then becomes free; the posterior flagellum borders the convexity of the posterior portion of the body (where there possibly exists an undulating membrane much less developed than the membrane of the anterior portion) then borders the posterior extremity of the body, then suddenly turns on itself and becomes free; flagella, each about 15 μ long, making the total length of the parasite about 50 μ.

HABITAT.—Blood of the redeye (*Leuciscus erythrophthalmus*); France.

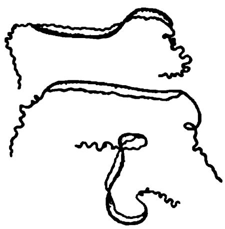

FIG. 83.—*Trypanoplasma Danilevskyi.* (After Labbé, 1891, p. 230.)

Trypanoplasma Danilevskyi[a] (Labbé, 1891).

(Figure 83.)

SPECIFIC DIAGNOSIS.—*Trypanoplasma:* 15 to 20 μ long, scarcely 1 μ broad; body elongate, filiforme.

HABITAT.—Intestine of leeches; France.

It is more than possible that this parasite was taken in with the blood of some vertebrate.

TECHNIQUE.

Examine fresh or defibrinated blood. Also, spread blood in a thin layer on a cover-slip, allow it to dry superficially, then fix in absolute alcohol 1 to 2 minutes, and color for 3 to 5 minutes in dilute methylene blue.

Doflein recommends for permanent preparations the same method used for amebæ, or Ziemann's modification of Romanowski's method. The following staining fluids are mixed in a watch glass just before using:

	Grams.
1. One part of the mixture—	
Methylene blue	1
Borax	2.5
Distilled water	100
2. Four parts of the mixture—	
Eosin	.1
Water	100

"This mixture colors in about 10 minutes, and in many cases very nicely differentiated, in that the plasma appears blue, flagella red, and chromatin also red, but of a different shade. If one of the two colors is too intense, place the cover slip in the other color for a short time." Then treat the preparation in the usual way, finally making a balsam mount.

Laveran & Mesnil (1901e) recommend highly the following method:

(1) The blood is spread in a thin layer on a slide, dried rapidly, and fixed in absolute alcohol for 10 to 15 minutes.

(2) The following solutions are prepared in advance: (a) Methylene blue with silver oxide or Borrel blue. Into a phial of about 150 c. c.

---

[a] SYNONYMS.—*Trypanomonas Danilevskyi* Labbé, 1891; *Trypanosoma* (*Trypanomonas*) *Danilevskyi* (Labbé) Doflein, 1901.

are placed a few crystals of nitrate of silver and 50 to 60 c. c. of distilled water; when the crystals are dissolved the phial is filled up with a solution of soda, and the whole is shaken; there is formed a black precipitate of oxide of silver, which is repeatedly washed in distilled water, so as to remove the nitrate of soda and the excess of soda; then upon the silver oxide is poured a saturated aqueous solution of methylene blue, prepared with Höchst's medicinal methylene blue. These are left in contact for about two weeks and shaken repeatedly; (b) 1 per cent aqueous solution of eosin (eosin soluble in Höchst's water); (c) 5 per cent solution of tannin.

The staining mixture is prepared *when one is ready to use it* according to the following formula:

	Cubic centimeters.
1 per cent eosin solution	4
Distilled water	6
Borrel blue	1

The slide upon which the blood has been spread and fixed is immersed in the staining mixture which has been poured into a Pétri dish, for example, and it is left there from 20 to 30 minutes.

Upon being removed from the bath the preparation is washed very freely with water, then treated with the tannin solution (10 to 15 minutes); it is then washed again freely with water, and then with distilled water, after which it is dried.

When there has formed a precipitate that is a hindrance in the examination, the preparation is washed with essence of cloves, then with xylol, and a fine cloth saturated with xylol is passed over the surface of the preparation. The preparations are better preserved dry than in balsam, and especially better than in cedar oil, in which they rapidly lose their color.

When the staining has been successful, the protoplasm of the *Trypanosoma* stains light blue, the nuclei stain violet and also the centrosomes and the flagella, in their free portion as well as in the part which borders upon the undulating membrane; the undulating membrane remains colorless or takes on a very pale bluish tinge. The blood corpuscles are stained pink, and the nuclei of the leucocytes deep violet.

SOURCE OF INFECTION BY THE PARASITE OF SURRA.

Opinions differ as to source of infection. While the drinking water and herbage, and grain containing feces of rats and bandicoots have been viewed with suspicion by prominent authorities, some authors suspect that flies of the family Tabanidæ act as transmitters of the organism. This latter view is strongly supported by analogy, for tsetse disease, which also is caused by a trypanosome (*Trypanosoma Brucii*) and which some authors look upon as nearly if not quite identical with surra, is carried by the tsetse fly (*Glossina morsitans*), and *Trypanosoma Lewisi* of rats has been shown to be transmitted by fleas, while lice also may disseminate this same parasite.

Lingard (1899, p. 74), in discussing the methods of infection, assumes "that animals (equines, bovines, solipeds, and buffaloes) acquire surra by the entrance of the *Trypanosoma* into their systems in one of four ways—

> "(1) From eating grass and vegetation grown upon land subject to inundation.
>
> "(2) From drinking stagnant water during certain months of the year.
>
> "(3) From the bite of certain species of flies, probably as carriers of the virus.
>
> "(4) From the ingestion of corn soiled with the excrement of the rat and bandicoot."

Of these methods it seems to us that the insect theory is by far the most plausible.

A. FROM THE BITE OF OR INFECTION BY INSECTS AS CARRIERS OF THE PARASITES.

Lingard (1899, p. 75) demonstrated in 1891 that the "body fluids" of certain flies, after sucking the blood of surra animals, contained *Trypanosoma* in varying numbers, and, further, that healthy animals when inoculated with such soiled material contracted the disease after a period of incubation. These facts, taken in connection with the recent experiments on nagana and on rat trypanosomiasis, indicate very strongly that Evans's surra is transmitted by dipterous insects. Lingard mentions *Tabanus* (gadflies), Hippoboscidæ (louse flies), Muscidæ (flies), and Culicidæ (mosquitoes) as bothering the animals in India. He quotes the following (1899, p. 78) from "Nawabkhan, the camel jamadar of the Third Punjab Infantry," who "has the reputation of knowing more about the camel than anybody else in the district:"

> "The prevailing opinion among the natives in this district is that surra is caused by the bite of a large brown fly (the size of a small bee) called *Bhura dhang*. In the month of May that fly comes from the ground in jungle land that has been under water. In June and July the flies are very numerous and in full force; about the 15th of August they begin to diminish, and early in October they are obtained with difficulty. The fly bites horned cattle and donkeys, but these suffer no ill effects; it bites men, and a painful swelling follows; it bites horses and camels, and gives them a fatal disease known by several names, such as *khanhog*, *doaia*, and *surra*, depending upon the several stages. *Phipri* is another name by which it is known among camels. I know of no reason for saying that the fly causes the disease except the common tradition of my people." (Griffith Evans, 1880.)

Lingard (1899, pp. 22, 78–79) further states:

> "*Flies.*—On the 24th of September at Mohand I demonstrated microscopically the surra hæmatozoon in the blood of flies taken from the bodies of horses suffering from the disease, in the blood of which the protozoon was present at the time.
>
> "The presence of the *Trypanosoma* of surra in the body fluids of certain species of flies caught near to or on the bodies of animals (horses, dogs) suffering from that disease was frequently observed and demonstrated at the Poona Laboratory in

1890. We have before pointed to the fact that when once the disease exists its further development in other animals is frequently due to the bite of flies, which carry the soiled blood on their piercing organs.

"The chief question which presented itself for solution was whether the *Trypanosoma* is ever to be found in the body fluids of flies and ticks (1) during the hot season of the year, when it is very exceptional to find a case of the disease, or (2) during the early part of the rains before the disease has manifested itself in animals. In order to elucidate the above problems it was necessary to visit the localities known to be surra centers during the hot season, but just before the rains usually commence at the end of May and beginning of June, and a second time about the end of August and beginning of September, the middle of the rains, on each occasion to systematically make a very large number of microscopical observations of the different fluids to be examined.

"With this object in view (1) in the hot season, numerous specimens of the thoracic and abdominal fluids of the following species of Diptera were submitted to microscopical examination: (*a*) Large green-headed fly (*Tabanus lineola*), (*b*) large brown-headed fly (*Tabanus tropicus*), (*c*) horse and cattle fly (*Hippobosca maculata*), (*d*) small variety infesting dogs (*Hippobosca*), (*e*) local varieties of the Muscidæ, and (*f*) mosquitoes (Culicidæ).

"Flies obtained from every available source were submitted to microscopical examination. During a sojourn in a surra locality we engaged coolies to supplement our own staff; consequently fresh supplies of Diptera were brought in several times daily. These were carefully examined in the fresh state. In different districts one or more species of flies were generally found to predominate, but they varied also in number and species according to the season of the year.

"The microscopical examination of the water, mud, fresh-water shellfish, flies, and ixodes collected during the hot season observations failed to reveal the presence of any form of *Trypanosoma*.

"(2) During the rainy season tour, hundreds of flies belonging to some ten different species, together with ticks from equines and canines, were collected and their body fluids submitted to microscopical examination, but in all cases with negative results as regards the presence of the *Trypanosoma*.

"Veterinary Capt. G. H. Evans, during his tours in Burma, has been good enough to make a large number of microscopical observations for this report, but has failed to detect anything like the surra hæmatozoon in the jungle Diptera examined. He states that a fly exists in Burma, a little larger than the common house fly, with body yellowish in color and with its legs bent on themselves. At the point where this fly bites a small extravasation of blood appears just under the skin, which shortly after presents the appearance of a blood bleb, such as follows a contused wound. These insect pests are present in great numbers just before thunderstorms at the termination of the hot season, not only in the plains, but also at Thandaung in the Karen and Binjyi in the Shan Hills. The gaur (Indian bison) and tsaing suffer from rinderpest and foot-and-mouth disease, yet these animals have, up to the present, never been observed with surra, although careful search for the disease has been made. They live in heavy jungle where the flies are so annoying to them that they have to go in the open to escape their attacks."

Griffith Evans (1881, p. 8), in his excellent discussion, appears to be the first European to suggest flies as transmitters of surra. He says:

"It is not improbable, however, that those flies so excessively troublesome at Jutta and other outposts, which bite horses so that the blood streams down the legs as if it had been squirted on, do convey the disease from one horse to another by inoculation. It is a fact that the disease does spread mostly at those posts where the horses are closely packed and the flies are in greatest numbers; but those are

> the posts also where the drinking water is worst; so that it is extremely difficult to form a true opinion upon this subject without further experiments. However, the indications at present are that horses affected with surra should be kept at a distance from other horses during the season when those flies are common. They were becoming scarce in the early part of October. I obtained two specimens with difficulty. I do not know yet what is their scientific name. They are very large, of a brown color, and common in many parts of India. The natives call them bhura dhung, which means a great needle-like sting. There is a common opinion prevailing among the natives of the Dera Ismail Khan district that this fly is the cause of the disease. I shall refer to this again, and merely mention it here because I think the fly may sometimes propagate the disease by inoculation, and thus be an item among the causes to account for the spread of the disease more at some posts and in some years than others, though the disease would exist independently ot them. When the horses stand close together the fly is able to go from one horse to another before the blood about its mouth is dry; whereas if he had to travel some distance through the dry air, in the hot sun, the virus of the blood would perhaps be destroyed."

Pease (1897, p. 560) says that the natives have for years attributed surra to *Tabanus tropicus*.

The fly theory of surra explains satisfactorily a number of facts which have long been observed in connection with this malady. Thus, surra is a disease of wet weather, and, as we have already pointed out, biting flies are practically creatures of moisture. They breed more rapidly in wet weather, and pupæ are more likely to issue when the surrounding media are moist than when they are dry. Howard,[a] in discussing the Tabanidæ, says:

> "The adults are great water drinkers, and are usually most abundant in the vicinity of inland ponds and streams. This has suggested to Porchinsky, the Russian entomologist, the desirability of coating such ponds with kerosene, and his experiments resulted in the destruction of great numbers of Tabanids.
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> "The larvæ of the Tabanidæ live in the earth or in water and are carnivorous, feeding upon soft-bodied insects and water snails. The spindle-shaped brown or black eggs are deposited in summer in groups attached to the leaves or stems of herbage. The gadflies vary greatly in color and size, and the smaller ones of the genus *Chrysops*, sometimes called 'deer flies,' are frequently quite small and colored with yellow or green. The larger ones vary through gray and brown to black. Our largest gadfly is *Tabanus americanus* Först., which is 1¼ inches long, and has a wing spread of 2½ inches. It inhabits the Southern States. About 1,500 species are known, and perhaps 200 occur in this country."

The importance of moisture in connection with biting flies in general is also ably set forth by Miss Murtfeldt[b] in the following passage:

> "The horsefly,[c] very numerous and annoying to cattle during May and June, entirely disappeared some weeks since, the manure drying out too rapidly to afford the larvæ time to develop. Even the housefly and other annoying Muscidæ are comparatively few in number."

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[a] The Insect Book, 1902, pp. 131-132. New York.

[b] Drought, Heat, and Insect Life, by Miss Mary E. Murtfeldt, Bull. 31, n. s., Div. Entom., U. S. Dept. Agric., 1902, pp. 97-99.

[c] Reference is apparently made to *Stomoxys calcitrans*.

George H. Evans (1899, p. 41) states that in Burma flies are particularly bad after the first few thunderstorms. Again, surra is acknowledged to be more common in moist places, as near rivers, ponds, and marshes. In this connection it may be pointed out that flies also are more common in such localities.

Nariman & Vaz (1893, p. 403) are authority for the statement that there is a common belief among natives that animals acquire surra by eating filth from the refuse heaps outside of the villages. This belief also supports the fly theory, for refuse heaps attract flies, and on this account there would be a greater chance of infection when horses feed around such heaps.

Pease (1897, pp. 557–558) has stated that he has seen all the dogs of a village infected from eating the carcasses of animals which died of surra, and that cats become infected in the same way. It seems to us, however, that it is perhaps an open question whether the dogs were actually infected through eating the meat or whether the carcasses had attracted flies which in turn had bitten the dogs. Both explanations seem plausible, for the parasites might enter the dogs through some wound in the mouth, such as could easily be made while gnawing bones.

Rodgers (1901, p. 164) has recently experimented with the transmission of surra by flies. In every case where they were kept from one to four or more days after biting an infected animal no disease developed when these flies bit healthy animals; but fresh flies—that is, immediately after biting infected animals—produced infection in healthy animals. No developmental stages of the parasite were found in the tissues of flies, and such insects fed to a rat failed to produce infection.

The fly theory also agrees entirely with experimental subcutaneous inoculations. It has been abundantly demonstrated by various observers that surra may be transmitted by subcutaneous injection, and also that horses contract surra readily in the usual period (5 to 7 days) when a small scratch on the muzzle is smeared with a trace of soiled blood. The bite of a fly or the soiling of a scratch by a fly whose beak, body, or legs are soiled with undried trypanosomatic blood corresponds to these cases of experimental infection.

It is very noticeable that in speaking of prevention, a number of authors advise removing the animals to more healthful ground, and it seems quite reasonable to assume that such a change would naturally be to a region where flies are less common.

Finally, Steel (1886a, p. 170) records that gray and white mules suffer most, and in this connection we may point out the fact that, according to Professor Wallace, flies attack light-colored animals more than they do dark ones. Whether they actually do attack lighter animals more, or whether they are only seen more easily on a light background, is perhaps an open question. There can, however, be little doubt that certain mosquitoes attack whites more than they do negroes, and the apparent relation between the white and gray mules, the flies, and surra, is, to say the least, a tempting explanation.

We are by no means convinced as yet that biting insects play any *necessary* rôle in the life history of *Trypanosoma* comparable to the rôle mosquitoes (of the genus *Anopheles*) play in the sexual generation (sporogony) of *Plasmodium*, the cause of malaria. Up to the present time far too little is known regarding the variations in the life cycle of the Trypanosomidæ to warrant any but the most reserved conclusions, but the indications, to our minds, are that whether or not the parasite of surra *may* pass a sexual stage of reproduction in *Tabanus* (gadflies), such a sexual stage does not appear to be necessary for the dissemination of the disease by insects. In other words, the indications seem to be in the line of the explanation given by Griffith Evans (1881, p. 8), namely, that flies with undried surra blood on their beaks may transmit the disease. If these indications have been correctly interpreted by us, consistency would compel us to admit that not only *Tabanus tropicus*, but any other biting or piercing insect, such as *Stomoxys calcitrans*, and even the ordinary housefly (*Musca domestica*), might act as transmitters. Accordingly, we at present are inclined to believe that if by any chance a surra patient were brought to this country, the disease could spread here, even if no Asiatic insects were accidentally introduced at the same time. In other words, our American biting flies, and even mosquitoes, must be taken into consideration as possible or even probable disseminators of the contagious material.

Some flies which Dr. J. J. Curry, of the medical corps of the United States Army, collected in the Philippines have been forwarded by him to Dr. L. O. Howard, entomologist of the United States Department of Agriculture, and have been determined as the common biting stable fly, *Stomoxys calcitrans*. Dr. Curry states that he collected the specimens in question from surra horses, and that in his opinion this is the fly which is the common transmitter of the disease in the Philippines. He has repeatedly found the surra parasite in the stomach and in the proboscis of this *Stomoxys*, but we are not informed that any direct experiments have been made to transmit surra by means of the insect in question.

B. BIRDS AS POSSIBLE TRANSMITTERS OF SURRA.

Lingard (1899, p. 22) also mentions the possibility of the accidental transmission of surra by crows. He says:

> "Several instances presented themselves where both healthy and diseased horses were standing side by side; both classes of animals presented open sores (galls) on their bodies, generally on either side of the spinal column. Crows were perched on their backs, pecking and scratching the sores, and in several instances drawing blood.

The birds moved freely from the back of one animal to the other, and no doubt this is one source by which the disease is spread. This would occur with the greatest ease either with their blood-stained beaks or with their soiled feet coming in contact with a raw surface, for I have proved that a minute fraction of a drop of blood containing surra hematozoon is capable of conveying the disease to the horse if spread over a scratch in the skin of the animal."

We see nothing improbable in this view. In fact, surra appears to us to be a wound disease, transmissible through any sort of wound, whether it be made by insects, crows, syringes, knives, or anything else, provided undried trypanosomatic blood comes in contact with the freshly wounded surface.

C. INFECTION BY INGESTION OF BLOOD OF AFFECTED ANIMALS.

A number of experiments have been made to transmit surra to animals by feeding the blood of infected animals, and attention has already been directed to the statement that dogs and cats are alleged to become infected through eating surra carcasses. We are inclined to accept this as a possible method of transmission, but in this connection we would direct attention to the following points:

(1) It does not appear to be satisfactorily demonstrated (*a*) whether the parasites have forced their way through the intestinal mucosa (as does not seem impossible: Compare bacterial infections; tuberculosis; trichinosis; *Balantidium coli*, according to Strong's recent interesting results); or, (*b*) whether the hematozoa have entered the system through some intestinal wound. (2) It also does not appear in the ingestion experiments that authors have always excluded the possibility of accidental infection by insects. Infection by ingestion of blood does not at present come into very serious consideration in connection with the transmission of surra from horse to horse, unless perhaps the horses should lick fresh, bleeding fly bites, and thus accidentally smear a wound in the mouth with trypanosomatic blood.[a]

D.? CONGENITAL INFECTION.

According to Lingard (1895, p. 12), no *Trypanosoma* has been found in the fetuses in case of rats, even when the gravid mother was found infected. This conclusion is based upon a number of observations, and apparently establishes the fact that, at least under normal conditions of the placenta, surra is not congenitally infectious. (See also pp. 111, 128.) This view is supported by other authors also.

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[a] An article has just been obtained from Rodgers (1901), who shows (p. 168) that, if surra blood is fed to an animal with an abraded surface with which the blood comes in contact, infection will take place. If there is no abrasion, no infection follows.

E.? FROM DRINKING STAGNANT WATER AND EATING VEGETATION GROWN UPON LAND SUBJECT TO INUNDATION.

In discussing infection from these sources, Lingard (1899, pp. 74–75) says:

> "The question of grass and water being the carriers of the contagium of surra is so intimately associated that it will be as well to consider these two factors together in their relation to the causation of the disease. The distribution of this malady seems to be entirely influenced by the physical aspect of the country. It appears to be chiefly brought about by the occurrence of floods and inundations, being far more prevalent in those parts of the country where these occur than in the higher and drier portions. It is far more common in the vicinity of the rivers and canals than in portions of the country where water is scarce. It is not usual for the natives of India to make any provision for the maintenance of their animals in the form of hay or dried grass. The usual custom is either to graze their cattle where grass is to be found or to cut it from the jungles and wastes as it is required. Toward the end of the hot season grass on the higher lands has become burnt up; at lower levels, especially at the bottoms of nalas, swamps, and ponds, where water has been lying till a much later period, an abundant supply can generally be found, and it is from these sources that it is procured.
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> "Similar conditions operate at intervals during the wet season, or directly the rains have ceased, especially in those parts of this country where the temperature is high at this time of the year. The lands bordering on rivers and streams, or those which are low lying, become flooded, the herbage is covered with water, which in some cases, when the land has a clayey subsoil, disappears almost entirely by gradual evaporation, and such places are favorable for the development of low forms of life, and possibly for the *Trypanosoma*. Animals, therefore, which daily consume grass and drink water from such localities run a risk of taking into their systems the contagium of this disease. In confirmation of these statements we may mention one example from many collected. The inhabitants of a village "Naoni" in the Ghaziabad Tahsil, of the Meerut district, visited by Veterinary Captain Pease in 1895, informed him that some 40 out of 60 camels attacked had died out of a herd of 250. The people now drive the camels away to the Bangar or higher lying grounds during the rains, and water those animals which remain in the lowlands from wells only, in order to escape the disease. They attribute the disease to stagnant water, and do not allow their camels to drink at open places until the water has stood for a considerable time and become 'pakka' (wholesome). On the other hand, Veterinary Captain G. H. Evans reported the case of a pony which contracted surra in a compound in Rangoon. The grass was obtained by its attendant from any source available, while the water supplied to the animal came from the municipal supply pipes. This was the first case of surra acquired in that city observed by the above officer during a residence of some 6 or 7 years."

Lingard's presentation of this case does not absolutely convince us that either water or grass conveys the disease. There is nothing at present known in connection with the biology of any *Trypanosoma* which would lead us to look seriously upon the grass and water as sources of infection with surra, notwithstanding the fact that this method of infection has been referred to by so many authors. Naturally, stagnant water will not improve the health of animals, but, on the contrary, will increase the infection with parasitic worms, and so tend to reduce the condition of the stock. Futhermore, insects will be present in greater numbers under the conditions described, hence these localities will naturally present a greater chance for the spread of the disease. Our remarks are not to be interpreted as a denial of the possibility of infection in the way described, but simply as an expression of reserve or perhaps skepticism upon this point, pending further investigations. Our skepticism finds decided support in the remarks by Pease (1897), quoted on page 95 of this report.

F.? INGESTION OF GRAIN SOILED WITH EXCREMENT OF THE RAT AND THE BANDICOOT.

In discussing the subject Lingard (1899, p. 76) says:

> "In 1891 experimental inoculation of equines proved that out of 12 animals inoculated with soiled rat's blood 4, or 33 per cent, contracted surra and died of a virulent form of the disease in an average of 7 days. The above experiments raised the question as to how rats could cause the disease in horses, for the food would rarely, if ever, be soiled with the blood of these small animals. It therefore only remained to be tried whether the excreta of rats, in whose blood the infusorian was present at the time of its collection, could cause the disease when mixed with grain. Experiments with this end in view were carried out, and one Australian horse contracted surra in 1893, the incubation period occupying some time between June and September, during which the animal received daily rat excrement mixed with its ration of corn. This was evidence that when a horse is made to ingest soiled material day by day surra may finally be contracted, but whether the disease was ever actually produced in the natural course of events by this means at that time, there was no testimony forthcoming. Inquiries were instituted in different parts of India in order to discover whether any folklore existed on the subject, and syces and keepers of horses were interrogated for a similar purpose. In June, 1895, one gentleman, with many years' experience in India, stated 'that it was a fixed idea in the minds of many natives in the Northwest Provinces and Oudh that if horses were allowed to eat corn soiled with rat excrement some of them would be more than likely to die within a few months.' Again, the following statement was made by an old syce: 'It is a common belief among syces that rat's dung in the corn given to horses makes them ill.' Further testimony with regard to small animals was obtained to this effect: 'Some years ago we lost a couple of goats, and the native who tended them said death was due to the rat's dung we found among the stock of gram the animals had been fed upon.'
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> "From the above statement it will be gathered that animals can acquire the *Trypanosoma*, or organism of surra, by different means. The thousands of equines which have succumbed to that disease in the Punjab alone have to shift for themselves, and under no circumstances obtain anything as fodder but the grass they can find and water from the nearest source. Therefore the question of rat excrement can be at once excluded as a factor in the causation of the disease in that class of animals. But with regard to the question of surra being communicated by the bites of a fly, we know that when once the disease is started it may be reproduced to any extent by these insects. The evidence put forward with regard to the effect of rat excrement in corn is also of great importance to the horse owner in India."

We are inclined to accept Lingard's reasoning in this case with double reserve. While it appears that rats may contract horse surra, it has not been shown that *Trypanosoma* are found in the excrement either of horses or of rats, nor is it clear to us that during the experiment mentioned, extending over three to four months, the necessary precautions were taken to exclude fly bites and other factors. If, in fact, *Trypanosoma* accidentally reached the feces through intestinal hemorrhage, it is not clear how they could be infectious, for rat feces dry rapidly, and drying appears to kill this parasite, as has been proved also for other species of *Trypanosoma* (see p. 113). Finally, even if it is assumed that the rat trypanosomiasis found was identical with the horse surra, it is at least possible that it might have been transmitted by rat fleas perhaps as easily as by the ingestion of excrements.

SYMPTOMS OF SURRA.

GENERAL CLINICAL PICTURE.

Lingard (1893, pp. 62–64) has given the following summary of symptoms—the most complete summary which has as yet been published by any author whose papers we have been able to consult:

"Before describing the symptoms of surra, it will be necessary first to divide cases of the disease under two different heads, viz: A. Those which have contracted the disease in the natural course of events; B. Those which have acquired the disease by inoculation.

"*A. Symptoms of the disease as observed when contracted naturally.*—The invasion of this disease is usually marked by symptoms of a trivial character; the skin feels hot, and there may be more or less fever; there is also slight loss of appetite, and the animal appears dull and stumbles during action; thus early a symptom sometimes appears, which may be the first intimation received of the animal's indisposition, and which, as a guide to diagnosis, is of great importance; it is the presence of a general or localized urticarial eruption. If the blood be examined microscopically it may be found to present a normal appearance, but in the majority of cases a few small, rapidly moving organisms will be observed, giving to the blood, as it passes amongst the corpuscles, a peculiar vibrating movement, which if once observed will not readily be forgotten. If the hematozoon has not been discovered in the blood for some days, the before mentioned may be the only symptoms noticeable, and as a rule, when treated with febrifuges, the horse quickly improves in health and the appetite returns. This condition does not last for more than a few days, when the animal is again observed to present a dull and dejected appearance, and on examination well-marked symptoms are found; the skin is hot, the temperature more or less elevated, 38.7° to 40° C.; the pulse full and frequent, 56 to 64 beats per minute; the visible mucous membranes may appear clean, but the conjunctival membranes, especially those covering the membrana nictitans, are usually the seat of dark-red patches of ecchymosis, varying in size in different animals. There is more or less thirst and slight loss of appetite, the animal eating its corn and green grass, whilst leaving all or a portion of the dried grass with which it has been supplied. At the same time there are slight catarrhal symptoms present, including lachrymation and a little mucous discharge from the nostrils. Occasionally at this period of the disease the submaxillary glands may be found enlarged and perhaps somewhat tender on manipulation. One symptom is markedly absent, namely, the presence of rigors, or the objective signs of chilliness. In addition it will be noted that there is some swelling and edema of the extremities, generally between the fetlock and the hock, which pits but is not painful on pressure, and in the cases of horses there may be present also at this stage of the disease some swelling of the sheath. When the fever and concomitant symptoms have declared themselves during a short period, one thing becomes especially noticeable in every animal attacked, namely, the rapidity with which it loses flesh. If the blood has been examined microscopically during the second period of fever, at first a few hematozoa will have been observed in it, which day by day increase in number and reach a maximum, where they remain for a varying period, or at once suddenly or gradually disappear during the period of apyrexia. After the fever and the accompanying symptoms have for the second time been present for some days, the period varying from one to six, the animal is found to have lost the dull, dejected appearance and to look bright. The elevated temperature has fallen and, in some cases, has attained normal or even subnormal limits. The visible mucous membranes are clean and the conjunctival petechiæ begin to fade; the pulse, however, will be found to be weak and thready in character, but the appetite excellent, and, in fact, if it were not for the loss of flesh and slight edema of the extremities, there would be little to show that the animal was ailing. But unfortunately this condition does not continue for any length of time, for again the temperature is elevated; in the course of a few hours the thermometer registers a still higher degree, the animal is dull and dejected, and by the following day the visible mucous membranes present a yellow tinge; large ecchymoses, dark in color, appear on the conjunctival membranes; the action of the heart is irritable, the pulse full and quick, or at times intermittent, and regurgitation may be observed in the jugulars; the breathing is quickened and the individual respirations shallow. On watching an animal in this condition it may be noticed that it takes seven to eight very short inspirations, and these are followed by a much more prolonged and sonorous one; at the same time the breathing is more abdominal than thoracic in character. On examination of the extremities it will be found that the swelling and edema have increased considerably, and that on the undersurface of the abdomen, where it was previously confined to the sheath, it has now commenced to spread forward along the subcutaneous tissue between the skin and the muscles. During the whole of this time the appetite will have varied little, and the evacuations will be only slightly, if at all, altered in character. In the blood a repetition of the previous events takes place, the hematozoa make their appearance and run up to a maximum, and again suddenly or gradually disappear according to the length of the fever period. These periods alternating with and without fever may go on for a considerable time. The progress of the disease is variable, and greatly depends upon the condition of the animal attacked, the weak ones succumbing very rapidly; but each bout of the fever brings with it, as a rule, an increase in the severity of the symptoms. There is augmented yellowness of the membranes, fresh crops of petechiæ on the conjunctiva, a collection of gelatinous material at the inner canthi, which at times becomes red in color from an admixture of blood, and which on microscopical examination is found to contain a varying number of the surra hematozoa; increased swelling and edema of the extremities and abdomen, which now extends between the fore limbs and up the chest. During this time the wasting has been steadily progressive, especially the muscles of the back and those surrounding the hip joint and the glutei.

"Toward the termination of the disease, it will be noticed that an animal is disinclined to move, and when made to do so there will be manifest loss of power over the hind quarters, somewhat simulating a slight partial paralysis, and the hind quarters of the animal reel from side to side. In connection with this it may be noted that there is frequently present paralysis of the sphincter ani and a dilated condition of the anus. These symptoms taken together point to some interference with the normal functions of the spinal cord in the lower dorsal and lumbar regions, and are probably due to pressure caused by an exudation within the spinal membranes. In many cases shortly before death the heart's action becomes exceedingly violent, shaking the whole frame at each beat, so that the sound can be heard at some distance from the animal. In some of these cases the animal may suddenly drop dead; in others the emaciation and weakness become so pronounced that the animal falls to the ground, and, after a short bout of struggling, succumbs to the disease. In other cases, again, the animal falls to the ground and appears to be suffering from acute pain, struggles violently, sweats bedew the body, and the respirations are very hurried. The struggles soon exhaust the patient's strength, and for a time it lies quiet; soon, however, the struggles commence again, and this continues until death occurs.

"*B. Those which have acquired the disease by inoculation.*—Twenty-four hours after the subcutaneous injection of a small quantity of surra blood, in the great majority of cases, a small, circumscribed, and somewhat raised swelling is noticed at the seat of inoculation. After 48 hours the tumor has increased in size, and is accompanied by some edema; it presents a certain amount of tension of the parts involved, and is generally tender on manipulation. These conditions continue to increase, until by the fourth day the tumor may measure 3 or 4 inches in one direction, by 2 or 3 in the other, and raised to the extent of an inch or an inch and a half above the surrounding tissues, or in some cases present an almost circular form throughout. It will be also found that, if the tumor be firmly grasped, it is not fixed, but can be lifted up from the subcutaneous tissue. According to the nature and amount of the inoculated blood so will these symptoms rapidly present themselves, and either attain a maximum or be retarded, until, varying from the fourth to the thirteenth day, the tumor at the seat of inoculation will be found to have lost a certain amount of its tension and tenderness. From this date the swelling and edema will gradually begin to grow less, until, finally, after a period of 10 to 14 days, the only sign left of the former swelling will be a slight thickening of the skin over the point of injection; but at the moment when the tension and tenderness of the parts at the seat of inoculation become suddenly decreased, a symptom of the utmost importance clinically takes place, viz, at that moment the organism of surra enters the blood of the general circulation.

"The temperature on the day of inoculation, and in fact for several days afterwards, may remain normal in character, there being only a few points difference between the morning and evening observations. In other cases there may be a slight rise from the first evening, and a gradual progressive rise until the swelling at the seat of inoculation shows signs of reduction in size, when the temperature generally takes a decided rise again, and may attain 40° or 41° C. This elevation will last a varying period of from 2 to 6 days, and on the day following its onset the ordinary symptoms of fever will be noticed; and in addition there will be petechiæ on the conjunctival membranes, lachrymation, a slight mucous discharge from the nose, and in severe cases some oedema of the lower portion of the extremities, and perhaps of the sheath in horses. At the termination of the period of fever, the temperature will be found to have fallen to normal or nearly so; the animal will present a brighter aspect, and there is every appearance of its return to health; but in a few days the animal again appears dull and semisomnolent; the temperature becomes elevated, and a relapse takes place, and a repetition of all the symptoms in the primary paroxysm, including the reappearance of the hematozoon, is observed."

Griffith Evans (1881, p. 2) states that the symptoms of surra should be divided into (1) those common to other maladies, and (2) those characteristic of this disease. Invasion of surra, acquired in the ordinary way, is that common to all low fevers.

Surra in camels.—According to Hagger (see Lingard, 1899, p. 35), the most prominent symptoms in the camel, in addition to the fever, are swellings which appear on the sides of the chest near the pad and in the sheath and scrotum of males and in the udder of females. These swellings form into large abscesses containing an enormous quantity of thick cream-colored pus. From the first to the last there is progressive anemia, and, although the appetite generally remains good, the animal rapidly wastes away until it becomes a mere living skeleton. The parasite is not present in the blood continuously during the whole course of the disease. The periods during which it is present are marked by elevation of the body temperature (fever), which rises in some cases to 106° F. and sinks to the normal during the intermission, when the parasites are absent. The disease is invariably fatal in the horse, but the camel men aver that a small percentage of camels, which can tolerate it for three years, recover.

Surra in cattle.—According to Lingard (1899, pp. 80–88), surra will undoubtedly develop in bovines and buffaloes, but these animals do not appear especially susceptible to the disease; they may, in fact, recover from the attack, put on flesh, and appear in robust health.

Surra in wild animals.—We have scarcely any information at present in regard to surra in wild animals, but it seems very probable that some wild animal will be found which suffers from the disease in but a slight degree and which therefore will be able to keep up the infection of a district from year to year. Curry (1902) has recently reported surra in the Philippine "caribao" [kerabau, *Bubalis kerabau*].

ANALYSIS OF SYMPTOMS.

ONSET AND INCUBATION.

There is no history of a definite *onset* (Burke, 1891, p. 268; 1897, p. 191), and the condition is progressive, usually with a number of relapses. According to the Veterinary Journal, London (1896, p. 177), there is rarely an opportunity to note early symptoms, the attack usually being a mild one, with the animal a little dull and off its feed, but after a few days' rest, it apparently recovers, and the owner sends it back to work. The attack is somewhat of a bilious fever type, the animal being dull, listless, and leg-weary.

The *period of incubation* is apparently subject to considerable variation. It is 6 to 8 days (2 to 7 days, Steel, 1886a, p. 255) in experimental cases caused by inoculation with or ingestion of blood taken from animals affected with surra; if the blood is from a dead animal, the incubation may be prolonged to 13 days; in cases where the blood has been diluted with water, and been given by mouth, symptoms may not appear for even 75 days. (Hayes, 1898, p. 481.)

According to Lingard (1893, pp. 55–58), the period of incubation varies according to circumstances:

> "(*g*) *The latent period of surra*, or, in other words, the time which elapses between the introduction of the *materies morbi* into the system and the first appearance of the hematozoon in the blood of the general circulation, will be found to vary consider-

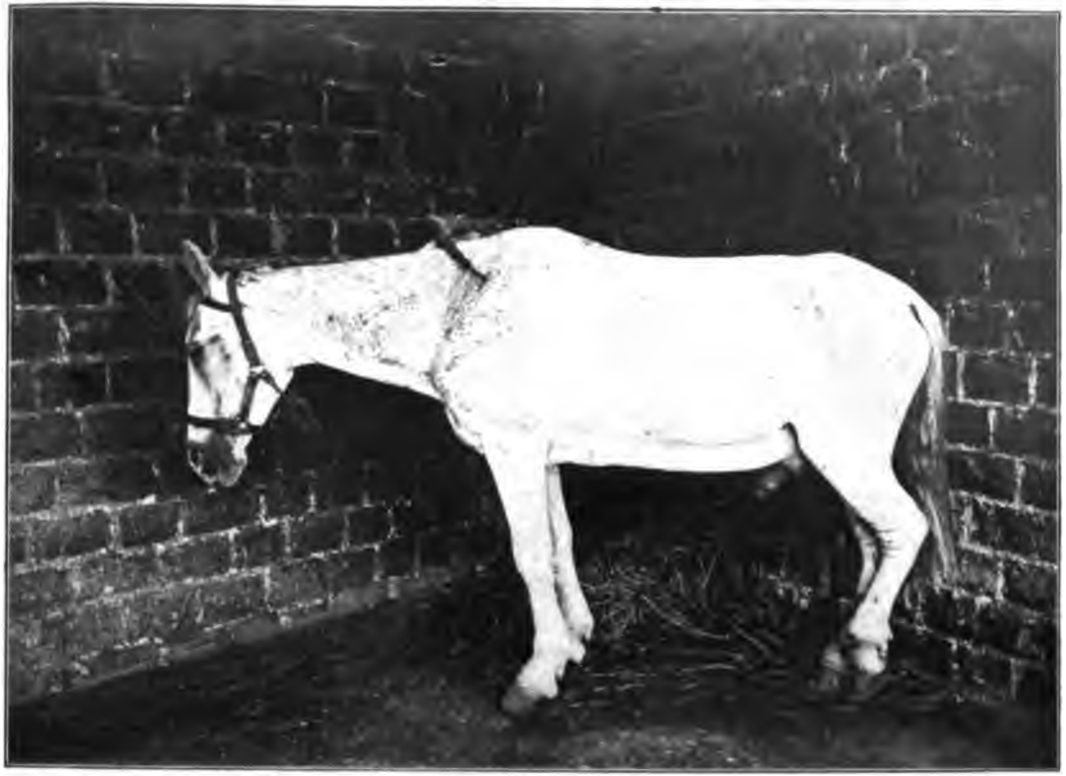

FIG. 34.—HORSE NO. 21 SHOWING THE SWOLLEN AND EDEMATOUS CONDITION OF THE EXTREMITIES, SHEATH, AND UNDERSURFACE OF THE ABDOMEN ON THE NINETEENTH DAY OF THE DISEASE.

(After Lingard, 1893; p. [illegible].)

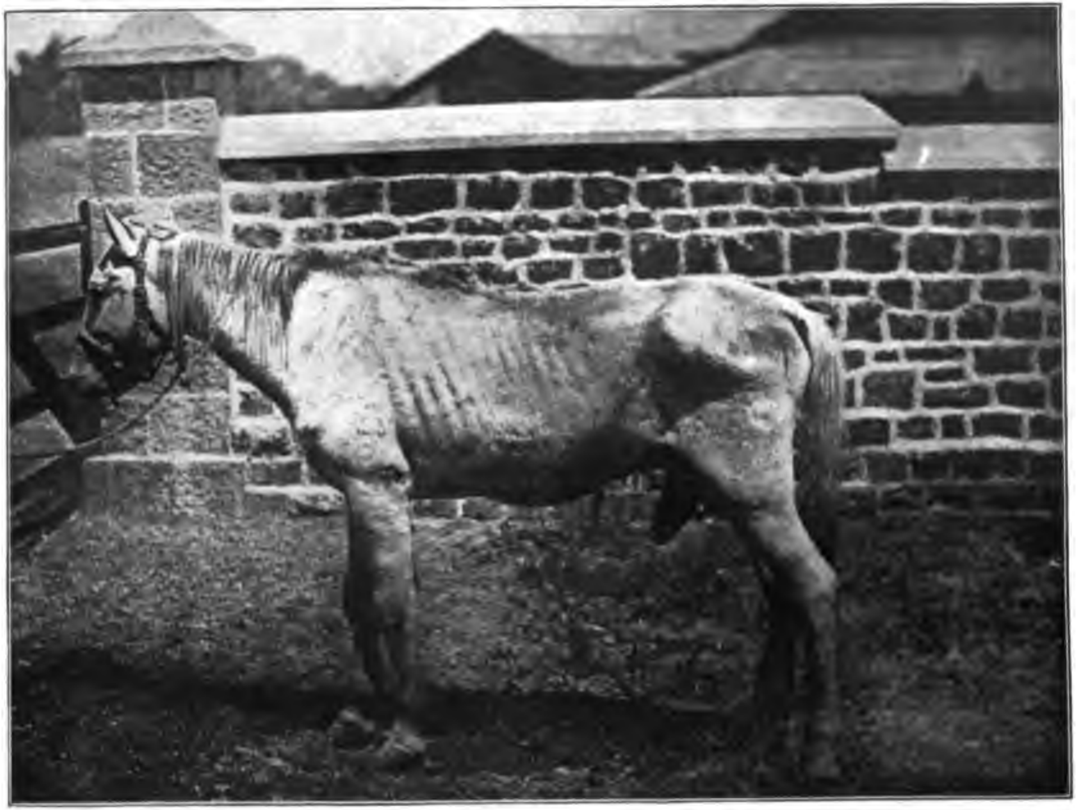

FIG. 85.—HORSE NO. 55, SHOWING CONDITION ON TWENTY-SECOND DAY.

(After Lingard, 1893: p. CLXVIII.)

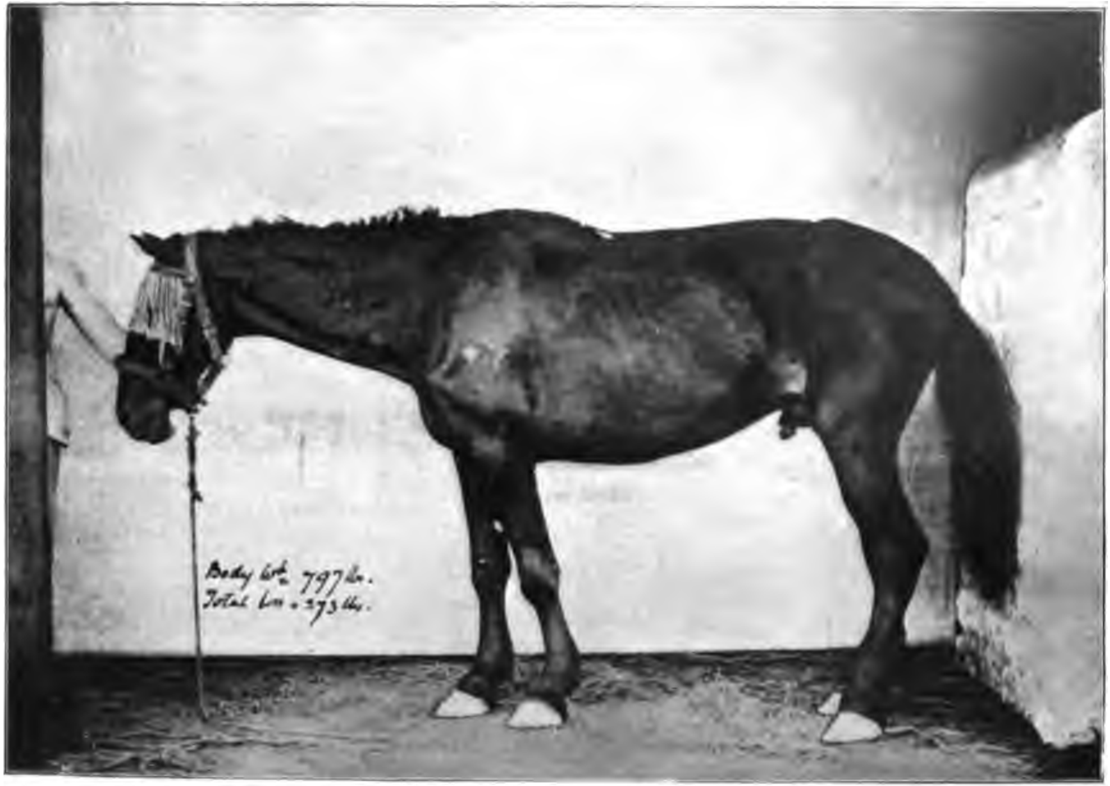

Fig. 86.—Horse No. 89, showing Condition on fiftieth Day of the Disease.

(After Lingard, 1899; Pl. I.)

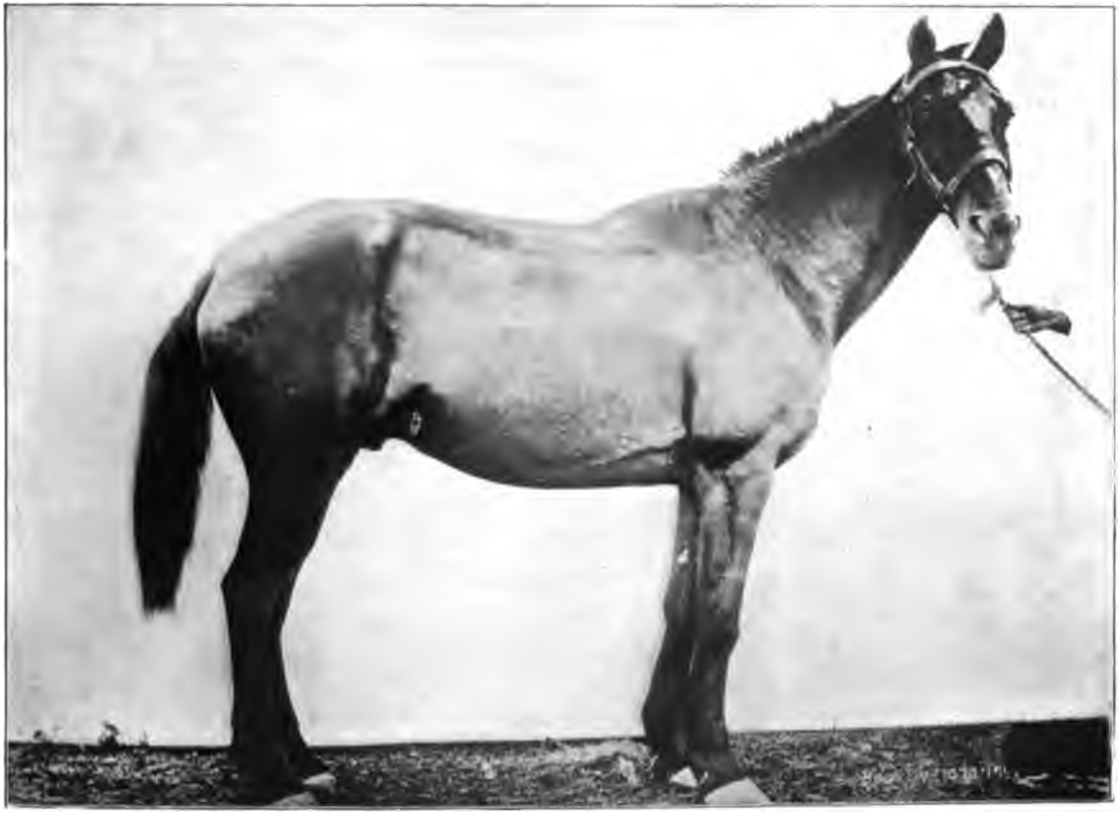

FIG. 87.—HORSE NO. 89, AFTER SUCCESSFUL TREATMENT.

(After Lingard, 1899; Pl. II.)

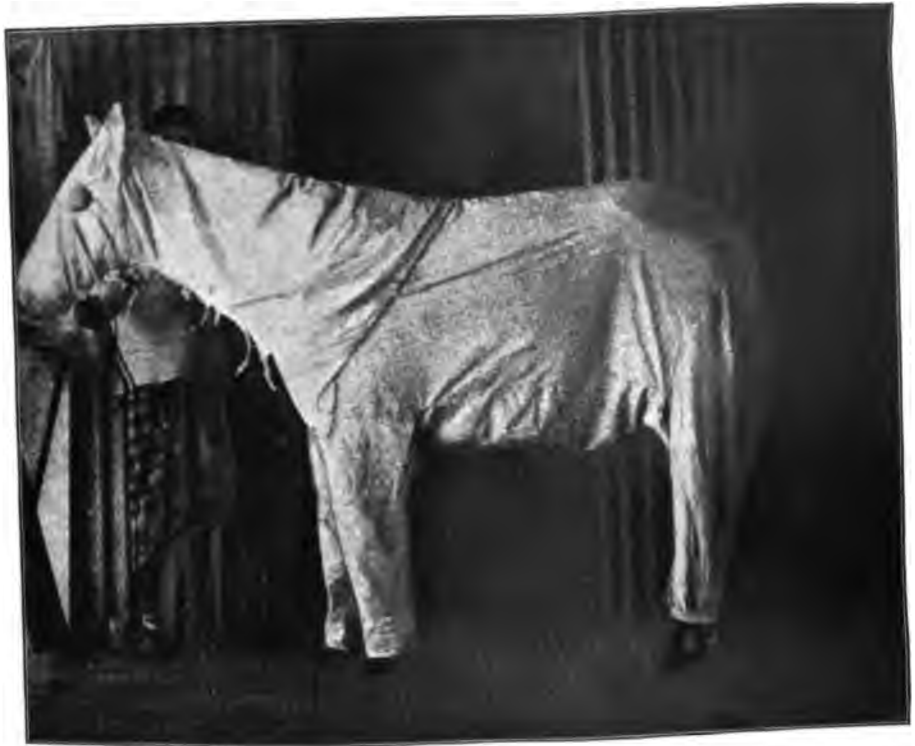

FIG. 88. PONY IN PAJAMAS, AS A PROTECTION AGAINST THE TSETSE FLY.

(Negative by Lieut. T. C. Johnson, A. S. C. Copied from Stordy, 1899; p. 11.)

ably according to certain circumstances. The chief conditions which influence it will be found under the following headings:

"I. The species of animal inoculated.

"II. The means used for inoculating the animal.

"III. The kind of fluid used for inoculation, viz: (*a*) blood; (*b*) serum; (*c*) fluid taken from the tunica vaginalis testis; (*d*) fluid taken from the pericardial sac; (*e*) cerebro-spinal fluid.

"IV. Whether the fluid used for inoculation was drawn ante- or postmortem from the animal affected with surra:

"(*a*) *Antemortem.*

"(*i*) If during a paroxysm, the number of hematozoon present at the time of inoculation.

"(*ii*) If during an intermission or an apyrexial period, the presence or absence of anything on microscopical examination.

"(*b*) *Postmortem.*

"(*i*) The number of hours that were allowed to elapse between death and the inoculation.

"(*ii*) The number of hematozoa in the blood just previous to death.

"V. The quantity of the fluid introduced into the system of the animal, either by—

"(*i*) Direct injection into the general circulation.

"(*ii*) Gastric ingestion.

"(*iii*) By subcutaneous inoculation.

"(*iv*) By smearing on an abraded surface or slight cutaneous incision from which no blood escaped.

"(I.) THE LATENT PERIOD IN NATURALLY CONTRACTED CASES.

"A most difficult point to clear up, and one which up to the present has not been recorded, is the latent period of surra in cases in which it is contracted naturally. The difficulty can more readily be understood when it is recognized that the contagium is, in all probability, taken into the system of the animal, together with its forage or water, or perhaps with both; and that at a subsequent period, when the symptoms of disease become evident, the animal may be in a different part of the country altogether.

* * * * * * *

"(II.) THE LATENT PERIOD, WHEN THE CONTAGIUM IS GIVEN BY THE MOUTH.

"(*a*) Gastric ingestion of a considerable amount of soiled blood.

"(*b*) In small doses in water, following more closely the way in which animals are supposed to contract the disease naturally.

"(*a*) *By gastric ingestion of a considerable amount of soiled blood.*—On the evening of September 29, 1880, Evans experimented upon a fairly healthy aged mare by administering 20 ounces of blood drawn from the jugular vein of an animal suffering from surra. On the morning of October 6, the blood when examined microscopically was swarming with very active parasites. In this case an observation was made on the 4th of October, to the effect that the temperature was 99.8° F. (37.6° C.); blood examined, but no parasite found; but there is no note on the following day, the 5th, regarding the condition of the blood, although the temperature is recorded as having been 102.2° F. (39° C.). Consequently I am inclined to believe that the hematozoon would have been found on the 5th if it had been looked for, taking into account the rise of temperature and the fact that the hematozoa were swarming in the blood on the morning of the 6th. In this case, then, the latent period may be said to have been only 5.5, or at the most 6.5 days.

"On the morning of the 30th of September, to a second mare Evans gave 20 ounces of blood, drawn from the jugular vein of the same horse as that from which the blood was taken for the preceding experiment. On the morning of the 6th of October, with a temperature of 103° F. (39.4° C.), the blood presented many parasites, but not swarming as in the last case. The latent period extended from the morning of the 30th of September to that of the 6th of October, or 6 days.

"(*b*) *By giving small repeated quantities of soiled blood in water.*—As no previous researches have been conducted with small quantities of soiled blood in water, it was decided to endeavor to produce the disease in a somewhat similar manner to that in which it is naturally contracted. With this end in view, a strong healthy Australian gelding was obtained, sixteen years old and in good condition, to which small quantities of blood mixed with a large bulk of water were to be given at short intervals. Accordingly on the 4th of May, 1891, 4 minims (0.25 c. c.) of blood (swarming with the surra hematozoon) mixed with 1 gallon of fresh water, were given to the animal to drink. Up to the 9th no change had taken place in the animal's condition, and on this date 8 minims (0.53 c. c.) of blood containing numerous hematozoa were given in the same way. On the 10th and 11th the animal showed no change. On the latter date 6 minims (0.4 c. c.) of blood containing the surra hematozoon were given in a quart of water. On the 12th a few small petechiæ were noticed on the membranæ nictitantes. Up to the 24th, with the exception of a slight indisposition on the 18th, which rapidly passed off, no symptoms of disease were noticed. On the 24th the animal received in water 8 minims (0.53 c. c.) of blood containing very numerous hematozoa; no change of any importance was noticed up to the 6th of June, and on that date the animal received in water 8 minims of blood containing numerous hematozoa. There was no change on the 14th of June, when 30 minims (2 c. c.) of blood containing very numerous hematozoa were given in 3 quarts of water. On the 16th no change having taken place, 10 minims (0.66 c. c.) of blood swarming with hematozoa were given. On the 17th 25 minims (1.6 c. c.), taken from horse No. 23 suffering from surra, but from which the hematozoon was absent, were given in a gallon of water. From this date to the 28th of June no change was noticed. On the latter date 200 minims (13.3 c. c.) of blood, containing very numerous hematozoa were administered in a bucketful of water. From this date (June 28) up to September 1 absolutely no symptom of disease was noticed; but from the 1st until the 6th of September there was a very slight disturbance of temperature, which, however, remained normal. On the morning of the 11th of September the temperature had risen to 39.4° C. and numerous hematozoa were observed in the blood.

"Thus it will be seen that from the first exhibition to the animal of the soiled surra blood on May 4, 1891, until the last on the 28th of June, a period of 55 days had elapsed; and from the exhibition of the last 200 minims, until the first appearance of the hematozoon in the blood, 75 days; or from first to last, 130 days.

"(III.) THE LATENT PERIOD WHEN THE FLUID USED FOR INOCULATION IS DRAWN ANTE- OR POSTMORTEM FROM THE ANIMAL AFFECTED WITH SURRA.

"*Antemortem.*

I. *Blood taken during a paroxysm*—

(*a*) *By gastric ingestion.*—Horse No. 20: 200 minims containing very numerous hematozoa. Period of incubation from the date of the last administration, 75 days.

(*b*) *By direct injection into the general circulation.*—Horse No. 15: 0.8 c. c. containing numerous hematozoa, 6 days. Horse No. 14: 0.7 c. c. containing numerous hematozoa, 5 days.

(c) *By subcutaneous injection.*—Horse No. 5: 3 c. c. containing very numerous hematozoa, 4 days. Horse No. 8: 1 c. c. containing very numerous hematozoa, 5 days. Horse No. 22: 1 c. c. containing very numerous hematozoa, 4 days. Horse No. 4: 1 c. c. containing few hematozoa, 8 days. Horse No. 30: 1 c. c. containing few hematozoa, 7 days. Horse No. 29: 0.8 c. c. containing few hematozoa, 7 days. Horse No. 59: 0.5 c. c. containing numerous hematozoa, 5 days. Horse No. 64: 0.5 c. c. containing few hematozoa, 7 days. Horse No. 12: 0.13 c. c. (2 minims) numerous hematozoa, 6 days. Horse No. 54: 0.1 c. c. containing swarms of hematozoa, 4 days. Horse No. 55: 0.1 c. c. containing swarms of hematozoa, 7 days. Horse No. 24: a fraction of 1 minim, very numerous hematozoa, 7 days.

II. *Blood taken during an intermission*—

(*a*) *By subcutaneous injection.*—Horse No. 13: 1 c. c. hematozoon absent from the blood, 8 days. Horse No. 21: 1 c. c. hematozoon absent from the blood, 8 days. Horse No. 48: 0.5 c. c. hematozoon absent from the blood, 10 days.

"*Postmortem.*

I. *Blood removed from the heart or great vessels*—

(*a*) *By subcutaneous injection.*—Horse No. 27 inoculated with 2 c. c. blood taken 16 hours postmortem, from which the hematozoon was absent, but very numerous antemortem. Latent period 11 days. Horse No. 11 inoculated with 1 c. c. blood taken 10½ hours postmortem, from which the hematozoon was absent, but very numerous antemortem. Latent period 11 days. Horse No. 18 inoculated with 2 c. c. blood taken 10 hours postmortem, from which the hematozoon was absent, but numerous antemortem. Latent period 13 days. Horse No. 19 inoculated with 2 c. c. blood taken 10 hours postmortem, from which the hematozoon was absent, but numerous antemortem. Latent period 9 days. Horse No. 32 inoculated with 0.3 c. c. blood taken 8½ hours postmortem, from which the hematozoon was absent, but very numerous antemortem. Latent period 9 days. Horse No. 46 inoculated with 1 c. c. blood taken 8¼ hours postmortem, from which the hematozoon was absent, but very numerous antemortem. Latent period 8 days. Horse No. 23 inoculated with 1 c. c. blood taken 5½ hours postmortem, from which the hematozoon was absent, but swarming antemortem. Latent period 8 days. Horse No. 58 inoculated with 1 c. c. blood taken 5 hours postmortem, from which the hematozoon was absent, but swarming antemortem. Latent period 9 days.

II. *Blood serum from the large vessels*—

(*a*) *By subcutaneous injection.*—Horse No. 7 inoculated with 1 c. c. serum taken 2 hours postmortem, the hematozoon was absent, but was numerous in the blood antemortem. Latent period 8 days.

"*Antemortem.*

Tunica vaginalis testis fluid and blood.—Horse No. 33 inoculated with 1 c. c. of fluid from the tunica vaginalis testis of goat, in which the hematozoa were numerous. Latent period 5 days. Horse No. 34 inoculated with 1 c. c. of blood from No. 33, antemortem containing numerous hematozoa. Latent period 13 days.

"*Postmortem.*

I. *Blood removed from the heart or great vessels.*—Horse No. 38 inoculated with 1 c. c. of blood taken 9½ hours postmortem, from which the hematozoon was absent, but very numerous antemortem. Latent period 9 days. Horse No. 41 inoculated with 1 c. c. of blood taken 9½ hours postmortem from case No. 40, from which the hematozoon was absent, but very numerous antemortem. Latent period 7 days. Horse No. 40 inoculated with 0.6 c. c. of blood taken 1¼ hours postmortem from case No. 34, from which the hematozoon was absent, but very numerous antemortem. Latent period 6 days. Horse No. 31 inoculated with 0.3 c. c. of blood taken 8 hours postmortem from case No. 33, from which the hematozoon was absent, but swarming antemortem. Latent period 9 days.

II. *Blood serum removed from the large vessels.*—Horse No. 50 inoculated with 2 c. c. of blood serum taken 45 minutes postmortem from case No. 38, from which the hematozoon was absent, but swarming antemortem. Latent period 9 days.

"INOCULATION OF OTHER ANIMALS THAN HORSES.

"*Antemortem.*

I. *Blood taken during a paroxysm from horses*—

(*a*) *By subcutaneous injection.* Bull: 1.7 c. c. containing very numerous hematozoa. Latent period 7 days. Sheep: 0.8 c. c. containing a few hematozoa, and with 1 c. c. containing a few hematozoa 14 days later, no organism found in the blood, but they were found on the fifty-ninth day in the fluid of the tunica vaginalis testis. Goat: 0.5 c. c. containing swarms of hematozoa. Latent period was 7 days. Rabbits: 0.3 c. c. containing very numerous hematozoa, latent period 5 days; 0.3 c. c. containing very numerous hematozoa, latent period 9 days. Guinea pigs: 1 c. c. containing very numerous hematozoa, latent period 12 days. Guinea pigs: 1 c. c. containing very numerous hematozoa, latent period 9 days. Guinea pigs: 0.5 c. c. containing very numerous hematozoa. This was a pregnant doe, and the latent period was 7 days, showing that pregnancy predisposes. Rats (*Mus decumanus*): 0.2 c. c. containing very numerous hematozoa. Latent period, 1 day. Rats (*Mus decumanus*): 0.1 c. c. containing a few hematozoa. Latent period, 2 days. Rats (*Mus decumanus*): 0.1 c. c. containing a few hematozoa. Latent period 2 days. Rats (*Nesokia providens*): 0.2 c. c. containing numerous hematozoa. Latent period, 2 days. Rats (*Nesokia providens*): 0.2 c. c. containing numerous hematozoa. Latent period, 5 days. Rats (*Nesokia providens*): 0.2 c. c. containing numerous hematozoa. Latent period, 5 days.

"*Postmortem.*

I. *Blood and other fluids removed from the body*—

(*a*) *By subcutaneous inoculation.* Goat No. 3 inoculated with 1 c. c. blood taken 5¼ hours postmortem, from which the hematozoon was absent, but swarming antemortem. Latent period, 6 days. Guinea pig inoculated with 0.4 c. c. cerebrospinal fluid 2 hours postmortem, hematozoa absent, but very numerous in the blood antemortem. Latent period, 11 days. Guinea pig inoculated with 1 c. c. pericardial fluid 13 hours postmortem, hematozoa absent, but swarming in the blood antemortem. Latent period, 10 days. Guinea pig inoculated with 1 c. c. pericardial fluid 13 hours postmortem, hematozoa absent, but swarming in the blood antemortem. Latent period, 10 days." (Lingard, 1893, pp. 55–61.)

STAGES AND DURATION.

The duration of surra varies with the species of animals attacked, their age and general condition, but sex has no influence. According to Griffith Evans (1881, p. 4), the records of the Fourth Punjab Cavalry show an average duration of 43 days after admission on the sick list. Burke (1888a, p. 9; 1891, p. 268) gives the average (taken from Evans) as probably not less than 2 months. According to Burke (1897, p. 192), naturally weak animals succumb more quickly than strong ones; in some cases the course is very rapid, and may be (1891, p. 268; 1892, p. 192) less than 1 to 2 weeks. Nariman & Vaz (1893, p. 403) describe the animals as dying by inches. The Veterinary Journal, London (1896, p. 179), gives the duration as proportionate to the animal's age, constitution, and condition; young horses may pass through seven or nine paroxysms, while old, worn-out animals may succumb quickly. Pease (1897, p. 560) states that nearly all cases take a month or more to kill, and Hayes (1898, p. 481) quotes Gunn as authority for 52 days as the average duration.

In discussing the subject of stages and duration, Lingard (1893, p. 73) says:

"*Stages.*—The fever of surra, as before mentioned, varies to such an extent in different cases that it is impossible to group any number of them under any one system of description as regards the stages of the disease. The insidious nature of the onset in the naturally contracted disease, devoid of symptoms during a considerable period, renders it impossible to recognize it until such time as the organism appears in the blood. Consequently little is known concerning the latent period and stage of invasion, and in such cases, when untreated, the fever is of a continued type, followed by one or more intermissions at long but irregular intervals.

"In this disease, when artificially produced, the majority follow the type before mentioned, but a number present a peculiar series of symptoms, reminding one of relapsing fever in man. But here again certain variations are observed. Such cases as Nos. 20, 38, 50, 54, however, lend themselves to description, which will be made clear on reference to the charts, and may be described as presenting well-marked stages, viz:

"I. The period of incubation, or latent period.
"II. The primary paroxysm.
"III. The intermission.
"IV. The relapse.
"V. Death.

"The paroxysms, as in relapsing fever in man, are again subdivisible into the accession, the pyrexial stage, and the crisis. But in all cases of surra we find periods during which the hematozoon is present, and others during which it is absent. The only system, therefore, under which all cases can be grouped is that having for its basis the presence and absence of the organism; the former we term the paroxysm and the latter the period of intermission."

THE COAT.

The coat of affected animals is described as staring. (Griffith Evans, 1881, p. 2.)

PERSPIRATION.

This symptom is entirely absent during the whole course of the disease, until just before death, when, as a rule, profuse sweating occurs. (Lingard, 1893, p. 68.)

ERUPTION, URTICARIA, EDEMA.

Referring to eruption and edema, Lingard (1893, p. 64) says.

"*Eruption.*—In the majority of cases, no eruption of any kind occurs during the whole duration of the disease. Steel, however, noted in mules an eruption of spots on the skin of the muzzle, resembling in its essential nature those he had observed on the mouth and nostrils. In the course of this investigation we have observed a number of cases of urticaria, appearing somewhat suddenly and, as a rule, disappearing after a few hours. The eruption has been either general or localized in character, and could be conveniently placed under several of the different classifications, viz: The affection which passes away in a few hours (*Urticaria ephemera*), or within a few days (*U. evanida*), or the form which is either preceded or accompanied by fever (*U. febrilis*), and lastly the (*U. nodosa seu tuberosa*), which is characterized by the appearance of nodosities of some size.

"If we further examine as to the dates on which the eruption occurred in the different cases, we find that in the naturally contracted ones (horses Nos. 65 and 73) it occurred on the first day of the disease, and was of the form known as *Urticaria evanida;* in horse No. 71 it appeared on the sixteenth day, and was an *Urticaria ephemera;* that in horse No. 3, on the eighteenth day was an *U. ephemera* also; and in horse No. 72, on the twenty-second day, *U. evanida;* in horse No. 20, which acquired the disease by gastric indigestion, it appeared on the ninth day of the disease, and was an *U. ephemera;* in the horses Nos. 22 and 6, it appeared in the former on the eleventh and in the latter on the twelfth day of the disease, both *U. ephemera.* And in the animals inoculated with the blood of the horses through the goat: In No. 41 the eruption appeared in 18 hours after inoculation (*U. evanida*), in No. 40 the eruption appeared in 68 hours after inoculation (*U. evanida*), in No. 30 the eruption appeared in 48 hours after the appearance of the hematozoon in the blood (*U. ephemera*), in No. 50 the eruption appeared in 48 hours after the appearance of the hematozoon in the blood (*U. ephemera*)." (Lingard, 1893, p. 66.)

Consequently it will be seen that the eruption of urticaria may take place at any time from 18 hours after inoculation until the twenty-second day after the appearance of the hematozoon in the blood.

"*Swelling and edema at the seat of inoculation in experimental cases.*—When an animal has been subcutaneously inoculated with the soiled blood or other fluids containing the 'materies morbi' of 'surra,' considerable swelling, as a general rule, follows at the seat of such injection. If we analyze this symptom we find that on the day following the operation a small raised, somewhat circular tumor appears, about 1 inch in diameter, while in some cases, especially when the blood used was obtained some hours postmortem, the measurements greatly exceed this, as in cases 27 and 41. On the third day the swelling has increased in dimensions, and probably measures from 1½ to 2 inches in diameter; it now appears tense, and is tender on manipulation. By the fourth day a still further augmentation in size, etc., has occurred, and from this date until the appearance of the hematozoon in the blood of the general circulation, the swelling, tension, and tenderness of the part may go on steadily increasing, or, as sometimes happens, it remains stationary. At this time it will be found that if the tumor be firmly grasped by the hand, one can readily lift it up from the subcutaneous structure, proving that it only involves the skin. A point of great interest and a symptom of the greatest clinical value occurs at the time of the organism leaving the seat of the swelling—for the hematozoon has been proved, as in horse No. 8, to be present in the fluid of the tumor 3 days after inoculation, and 2 days before being discovered in the blood of the general circulation; and, in the case of horse No. 54, 24 hours before its first appearance in the blood—in that the raised tumor, which was previously tense and so tender that the animal flinched whenever touched, now suddenly becomes soft and flaccid, and manipulation of the parts can be carried on with little or no notice being taken by the inoculated animal.

"It will, therefore, be recognized that from the time of inoculation until the organism leaves the tumor for the general circulation, or, in other words, during the latent period of inoculation, this disease is purely a localized affection, and can therefore be treated either by excision or by the injection of antiseptics at the seat of inoculation.

"In 1 case only out of 22, which contracted the disease by experimental means, was the swelling absent from the seat of inoculation, but in this from first to last, during a period of 9 days, no swelling or thickening of the integument could be felt. The shortest time noted in horses during which the swelling attained its maximum, and commenced to decrease in size was 96 hours, and the longest 12 days, the average length of 21 cases being 6.7 days. Within a very few days after the appearance of the hematozoon in the blood, the tumor has usually decreased considerably in size, and after a fortnight only a slight thickening of the skin can be noticed on careful examination of the part." (Lingard, 1893, pp. 66–67.)

According to the Veterinary Journal, London (1896, p. 177), with the rise in temperature there is usually an attack of local or general urticaria. There is generally some edema of the limbs, about the fetlocks and hocks, and beneath the belly, chest, and sheath.

In a large proportion of the cases the legs are swollen, and when pressed with the fingers they pit. Sooner or later a similar swelling is found between the fore legs of mares or at the sheath of horses, and the animal is dropsical (Griffith Evans, 1881, p. 3); (p. 4) the progress is variable, often marked by an increase of dropsical swelling which, however, sometimes subsides, again returning worse than before. Evans has seen some cases, in the last stage, in which there was no swelling, although it had been there before.

Nariman & Vaz (1893, p. 404) refer to an edema of an evanescent nature on the hind limbs, beginning at the fetlock and extending upward; edema of the sheath and testicles extending slightly to the lower part of the abdomen; later it becomes more prominent on the hind limbs and is often seen on the fore limbs, while the edema of the abdomen extends to the chest and breast.

Dropsy is frequent (Steel, 1886a, p. 169).

SWELLING OF THE SUBMAXILLARY GLANDS.

The submaxillary glands sometimes become enlarged. Griffith Evans (1881, p. 3) says that in a small proportion of the cases the submaxillary glands are enlarged and tender; in a few cases (Griffith

Evans, 1881, p. 4) the swelling of the submaxillary glands develops into an abscess, with a gluey mucous discharge from the nose. No other swellings are noticed and no ulceration of the nose nor tubercle of the lungs.

EMACIATION.

According to Griffith Evans (1881, p. 4), the most constant and invariable symptom in the progress of the disease is the wasting away of the flesh; and this appears the more remarkable, considering how much the patient eats and apparently with good appetite. This wasting, or withering away, goes on more rapidly in some cases than in others. Several authors refer to the patients as consisting only of skin and bones and as presenting a most pitiful appearance.

Lingard (1893, p. 80) says that the body is usually much emaciated, the word "surra" implying "rot" or "dry rot;" and the disease is characterized by a progressive loss of flesh, or withering of the tissues. In some cases, however, when the animal is carried off rapidly, owing to the severity of the fever or from other causes, it may be in fairly good condition.

EYES.

Lachrymation.—This at first is slight, but in some animals rapidly increases in amount until it becomes profuse. At a varying period in the disease there appears at the inner canthus a semigelatinous secretion, which may become mucopurulent in character, and during the presence of the hematozoon in large numbers in the blood, slight hemorrhages take place from the conjunctival membranes, and the secretion becomes blood-stained. At these times it always contains the hematozoon in varying numbers. (Lingard, 1893, p. 72.)

Griffith Evans (1881, p. 3) remarks that the eyes are "weeping," while the Veterinary Journal, London (1896, p. 177), states that the eyelids are swollen, and perhaps conjunctivitis may be present. Lachrymation may be profuse toward the end of the disease.

Petechiæ.—If the eyelids are inverted (Griffith Evans, 1881, p. 3) the conjunctival membrane is seen to be of a decidedly yellow color, often a dirty yellow, with claret-colored spots (petechiæ) on the eyelids, or, as is most common, on the membrana nictitans at the inner corner of the eye. According to Steel (1886a, p. 169), a characteristic feature of the disease, and one which seems to be in direct and close relations with the activity of the parasites in the blood, is the occurrence of "crops" of petechiæ, especially detectable on the conjunctivæ; they seem to occur when the parasites have attained their maximum activity and frequency, and when the temperature begins to fall.

This is not the only disease in which petechiæ or more extensive extravasations occur, for these are usually present in anthrax, so-called bilious fever, petechial fever, and other diseases; also when an animal is suffering from the presence of small nematodes in the general circulation. In surra the petechiæ on the conjunctival membranes are specially prone to invade the membrana nictitans of the Equidæ, and frequently attain a large size, becoming relatively extensive extravasations. They may precede the discovery of the hematozoon, but, as a rule, are found shortly after the first appearance of the organism in the blood, and commence to fade immediately when it disappears; and, as each successive brood of the hematozoon makes its debut, a fresh crop of petechiæ appears on the membranes, and it often happens that a second series of petechiæ is present before the first has completely faded. (Lingard, 1893, p. 72.)

Later, Lingard (1899, p. 26) says that the conjunctivæ are frequently stained with yellow, and there are successive crops of subconjunctival petechiæ.

Hemorrhages into the anterior chamber occasionally occur, but the amount of blood is generally small. The color at first is red, and after a period of 24 hours or more the coloring matter is absorbed, leaving the extravasated mass either of a whitish hue or somewhat yellow in the case of an animal in which the membranes are already tinged that color. As a rule, no absorption of the extravasated material takes place, owing to the short period which elapses between the occurrence of it and death. (Lingard, 1893, p. 72.)

The Veterinary Journal, London (1896, p. 177), also records that slight hemorrhages occasionally take place into the anterior chamber of the eye, followed by opacity.

Opacity of the cornea.—Complete opacity is of rare occurrence, but toward the termination of a long case a slight milkiness of the cornea may be observed, and is not at all infrequent. Lingard has, however, seen one case in an Arabian horse, where complete opacity occurred a few days before death, and therefore blindness supervened. (Lingard, 1893, p. 72.)

Hematozoa.—On several occasions *Trypanosoma* have been observed in the fluid of the anterior chamber and in the vitreous humor. (Lingard, 1893, p. 72.)

NOSE.

Catarrhal discharge.—There are slight catarrhal symptoms, the eyes weeping; and often there is a discharge from the nose of mucus more or less tinged with yellow (Griffith Evans, 1881, p. 3). In later stages there may be gelatinous or purulent discharge from the eyes and at times from the nostrils, with fullness and enlargement of the submaxillary glands. According to Lingard (1893, p. 73), there is often a slight discharge of clear fluid from one or both nostrils during the second week after invasion. This is the result of excessive lachrymation, which appears to a greater or less extent in all surra animals. The fluid passes down the lachrymal duct into the nostrils, and at a later date a clear albuminous fluid is noticed running from one or both of the latter. This comes from the nasal passages proper, and is the result of an inflammatory condition of the membrane covering the turbinated bones. This fluid after a time becomes mucopurulent in character, and another symptom is to be noticed, namely, snuffling-breathing, which points to the situation and cause of the discharge. If one could examine at this stage the mucous membrane covering the turbinated bones, it would be found to present a deep-red or purple color, from the highly congested condition of the capillary vessels, and to be considerably increased in thickness. The Veterinary Journal, London (1896, pp. 177–178), also refers to signs of catarrh, with a yellow-tinged discharge from the nostrils. Lingard (1899, p. 29) again refers to slight mucous discharge from the nostrils and eyes.

Petechiæ and injection of the nasal septum.—The presence of minute petechiæ on the walls of the *septum nasi* is of very constant occurrence. The mucous membrane covering the cartilage is tumefied, and presents small red points from which minute drops of blood exude. These points appear as if they might have been produced by punctures of a large number of needles, so minute are they. This condition does not show itself until the animal has been ill for some days, and then it might be easily overlooked without a certain amount of care in observation. (Lingard, 1893, p. 72.)

Ulceration inside the nostrils.—One observer (Steel) mentions the occasional occurrence in mules of ulcers on the Schneiderian membrane, when the epithelial débris remains as a yellow scab for a day or two and is then washed away by mucus. The earliest appearance of these ulcers in the nose is as though the membrane had been grazed and blood were slowly oozing. These ulcers rapidly disappear and the general character of the membrane becomes normal. Lingard has not observed these, however, in the cases of naturally acquired surra or in the inoculated cases. (Lingard, 1893, p. 72.)

The Veterinary Journal, London (1896, p. 177), also mentions that ulcers occasionally form on the Schneiderian membrane.

Thickening of the Schneiderian membrane.—This condition is frequently met, more especially at an advanced stage of the disease. By the entrance of air into the nasal passages and by its exit therefrom, a peculiar sound is produced, which is due to the swollen condition of the mucous membrane lining the cavities. On examination, a congested and arborescent condition of the vessels is found, particularly well marked on the upper part of the nasal septum. (Lingard, 1893, pp. 72–73.)

Epistaxis.—Lingard (1893, p. 73) observed bleeding from the nose once out of some 72 cases of surra. It occurred toward the termination of the disease. No great amount of blood was lost at one time, but the attacks were characteristically recurrent, occurring principally during the early morning.

MOUTH AND TONGUE.

When the disease has fairly set in, the tongue and membranes of the mouth become extremely pale, and later assume a yellow tinge. Some observers have noticed small symmetrically arranged ulcers in pairs on the tip of the tongue, and sometimes a degeneration of the epithelium, which at a later date separates from the deeper part of the membrane, leaving superficial circumscribed ulcers. (Lingard, 1893, pp. 69–70.)

VULVA, VAGINA, AND PENIS.

If the labia are parted it will be seen that the mucous membrane of the vagina is decidedly yellow, with petechiæ even more marked than in the eye (Griffith Evans, 1881, p. 3). When the petechiæ are well marked on the vulvæ of mares they are very suggestive of surra.

According to Lingard (1893, p. 78), serous effusion beneath the vulval membranes is not infrequent in mares, and Steel observes that "the irritation of these parts is, however, shown by frequent symptoms of 'horsing.' Indeed, in mares there is almost always in this disease a little reddish brown fluid dried about the external generative orifice, which discharge persists throughout the attack. The parallel to this sexual phenomenon of mares is seen in male animals, as frequent and quite uncalled-for erections of the penis, which may be due to irritation of the erection center in the cord, but possibly, also, is associated with the formation of clots in the erectile structure of the penis, which organ latterly in the attack remains permanently slightly protruded and turgid, or there may be embolic plugging in the vessels." (Lingard, 1893, p. 78.)

MUCOUS MEMBRANES.

The mucous membranes become yellow and petechiæ occur on one or the other; but these are not persistent, generally leaving entirely during the intermittent stage of the fever. (Vet. J., Lond., 1896, p. 177.) (See also "Tongue," p. 67; "Eyes," p. 64; "Nose," p. 65; "Vulva, vagina, and penis," p. 67.)

EXCRETIONS AND SECRETIONS.

URINE.

Quantity.—Griffith Evans (1881, p. 4) says that in some advanced stages the urine is passed more frequently and appears to be much more in quantity than normal, while Ranking (1891a, p. 399) describes the urine as abundant, and Nariman & Vaz (1893, p. 404) report that staling is frequent. According to Lingard (1893, p. 71), the quantity of urine in the early stage of the disease does not appear to vary to any great extent from that in health, but toward the end more is passed; but this must naturally depend to a large extent upon the amount of water taken by the animal during the 24 hours and upon the season of the year.

Color.—The urine of the horse in health when the animal is allowed to stand after exercise until cool, is turbid and yellow in color; carbonates of calcium and magnesium are precipitated. After inoculation with surra, the urine remains turbid, and becomes orange in color, and later of a dingy green or greenish yellow. If the kidneys become affected, the quantity secreted is diminished, the density of the fluid is increased, and the color changed to that of cream or a light-yellow ocher; the latter color lasts for a few days only, 4 at the most, and then the fluid becomes a greenish yellow or dirty orange. In some horses the fluid passed is very viscid, but not in all; however, in the case of mares it is usually so from the first, and remains so, as long as the urine is alkaline, but as soon as the fluid becomes acid, the viscidity as a rule diminishes. (Lingard, 1893, p. 71.)

According to Griffith Evans (1881, p. 3) the urine is highly colored (also Nariman & Vaz, 1893, p. 404), but may later become normal. The Veterinary Journal, London (1896, p. 178), states that the urine becomes viscid, dark yellow, orange, or orange green. In Burma (George H. Evans, 1899, p. 41) the urine of surra patients varies a great deal; sometimes it is viscid, other times not; in color, it varies from a reddish to a greenish yellow.

Bile pigments are frequently seen (Lingard, 1893, p. 71). Burke (1891, p. 268; 1897, p. 191) says that the urine contains much hemoglobin, which is set free by the destruction of the red blood corpuscles, and Ranking (1891a, p. 399) reports that in one fatal case a pigment was found "which was no doubt urohematoporphyrin," but no spectroscopic examination was made. According to the Veterinary Journal, London (1896, p. 178), blood is frequently present, while George H. Evans (1899, p. 41) says that blood is common.

Odor.—Lingard (1899, p. 24), in referring to surra among camels, says that the diagnosis is most surely made from the smell of the urine, which becomes very offensive.

Specific gravity.—The range observed in the specific gravity is very considerable, and in the same animal may differ widely from day to day. In the case of horse No. 72 it was as low as 1,004 on the 19th of October, 1892, and rose to 1,034 on the 20th, and to 1,046 on the 23d; the highest registered in any case was 1,055 (horse No. 26), 31st of October, 1891. (Lingard, 1893, p. 71.)

Reaction.—The reaction of the urine of horses is always alkaline in health, but varies according to the food given. In India the urine of animals fed upon oats is acid in reaction, while, on the contrary, when supplied with grass and gram the reaction is alkaline. When a horse is the subject of surra, especially in long-protracted cases, the urine remains alkaline until some 7 or 8 days before death, when it is found to change and become, respectively, feebly alkaline, at the expense of the carbonates of calcium and magnesium, neutral on the following day, then slightly acid, and finally strongly acid; and this acid condition of the secretion is maintained until death takes place; in some cases it lasts for as long as 6 days. (Lingard, 1893, p. 71.)

Nariman & Vaz (1893, p. 404) give the reaction as acid in advanced stages of the disease. In Burma (George H. Evans, 1899, p. 41) it is, as a rule, alkaline, but toward the close of the disease the reaction is often slightly or distinctly acid.

Urea.—Lingard (1893, p. 71) states that the quantity of urea passed during the paroxysms and apyrexial stages is at present under investigation. It appears, however, that the amount of urea excreted is increased to a considerable extent immediately after the parasite appears in the blood. During the paroxysms the amount undergoes a slight decrease, rising again during the absence of the hematozoon from the blood. It is a point of considerable interest that the maximum excretion of urea generally takes place during the second intermission, and after this period gradually diminishes with perhaps a slight occasional rise until the animal succumbs. This question, however, requires further investigation, and is now being carefully worked out.

Uric acid.—Uric acid is not increased in the horse, but in the ass it has been found to be present previous to inoculation, and to be absent after the appearance of the hematozoon in the blood. (Lingard, 1893, p. 71.)

Phosphates.—Phosphates are occasionally present, but in the great majority of cases are absent in any appreciable amount. (Lingard, 1893, p. 71.)

Albumen.—This does not appear until some little time after the first appearance of the hematozoon in the blood, and then only in small quantities, unless the animal develops signs of the kidneys being specially affected. In case No. 38 the animal presented well-marked symptoms of the kidneys having become involved. On examination of the urine, epithelium, blood, and granular casts were found daily; so that evidently the animal was the subject of an acute desquamative nephritis. (Lingard, 1893, p. 71.)

According to Ranking (1891, p. 399), Burke (1891, p. 268; 1897, p. 191), and the Veterinary Journal, London (1896, p. 178), the urine is frequently or usually albuminous. Nariman & Vaz (1893, p. 404) say that "later on" the urine is highly surcharged with albumen; while according to George H. Evans (1899, p. 41), in some cases of surra in Burma, small quantities of albumen may be present.

Casts.—Griffith Evans (1881, p. 5) failed to find casts, but George H. Evans (1899, p. 41) reports that granular-looking casts are common.

Sugar.—Sugar was not detected in a single case. (Lingard, 1893, p. 71.)

Parasites.—Parasites were not detected in the urine. (George H. Evans, 1899, p. 41.)

Retention and incontinence.—Retention and incontinence have not been observed in horses. (Lingard, 1893, p. 71.)

FECES.

Griffith Evans (1881, p. 3) did not find the dung abnormal in any case. He was told by the salootri, who laid great emphasis upon it, that the dung balls are sometimes coated with mucus, having red patches. "He showed me one of these; it was what we often find in health." Evans mentions, however, that in a few days after admission on the sick list the dung becomes normal. According to Lingard (1893, p. 70), the rule is that the bowels are constipated, although diarrhea coming on late in the disease is an occasional symptom. The stools retain for some time their natural color and consistency, but frequently become lighter than normal. At a later period they are usually coated with a layer of mucus of a light-brown color, the dung balls presenting a glazed appearance, or at times they may be tinged with blood. On microscopic examination of the brown mucus it is found to contain epithelium and a large number of colorless octohedral or polyhedral crystals. Toward the termination of a case, occasionally the dung becomes semisolid or pultaceous in consistency, and then emits a very foul odor.

Nariman & Vaz (1893, p. 405) refer to the feces in later stages as being "stinking and soft," and the Veterinary Journal, London (1896, p. 177), says that feces are, as a rule, normal throughout the attack, but occasionally there are signs of constipation, and at the termination of the disease there may be diarrhea.

In Burma, constipation is the rule, diarrhea the exception; dung is at first natural; later it is of a light-brown color, and toward the end of the disease it is frequently pultaceous and possesses a foul odor (George H. Evans, 1899, p. 41).

ACTION AND PARALYSIS.

According to Griffith Evans (1881, p. 2) the action is sluggish, occasionally with stumbling on the fore legs or dragging the hind legs on the ground. Burke (1891, p. 269; 1897, p. 191) says there is both an acute and a chronic form of paralysis—stringhalt, muscular tremors, crossing of legs, etc.; (1891, p. 271) in some cases of paralysis of the hind quarters, or other well-marked nervous symptoms, the gray matter of the cord generally shows blood extravasations and staining of the nerve cells, but beyond a tendency to congestion and occasional blood extravasation no lesions are usually discovered in the nervous system; (1897, p. 191) the symptoms described (stringhalt, muscular tremors, crossing of the legs) are due to some effusion of blood on the spinal cord or on particular nerves. Dragging of the hind toes is the result of muscular paralysis.

According to Nariman & Vaz (1893, pp. 404, 405) there is a dragging of the hind limbs and flinching on the slightest pressure over the loins; the animal begins to roll, is very unsteady in his gait, and prefers to lie down; soon the belly is tucked up; there is inability to rise; constant shivering followed by jugular pulsations, groaning, and death.

The Veterinary Journal, London (1896, p. 181), states that there is occasionally a considerable increase of fluid on the spinal cord about the lumbar region, which would probably account for the symptoms of paralysis sometimes present.

APPETITE AND THIRST.

Griffith Evans (1881, p. 2) describes the thirst as more or less abnormal, the appetite as capricious; (p. 3) later, the animal may refuse food, and there is great thirst. According to Steel (1886a, p. 169), in some cases the animals at last drop down and die suddenly, perhaps when they are eating and enjoying their food; in other cases they linger for days after they are down, too weak to rise, or too weak to stand after they are helped up; they may go on eating all the grass they get and much of the grain, until they die; it is remarkable how the animal in a state of semicoma will continue to eat grass almost without ceasing. Exceptions to this rule occur, for Lingard (1899, p. 61) examined an outbreak in which the most marked symptoms were *loss* of appetite, fever, emaciation, etc. Burke (1891, p. 269) says the appetite is greedy, or even voracious (1897, p. 191), but the debility appears progressive; the animal may continue to feed to the last. According to Nariman & Vaz (1893, p. 404), the appetite and thirst are hardly affected, but in many cases are abnormal. Later the appetite may be poor, the animal eating only a little lucern and grain; the thirst, however, is very great and there is profuse staling. The Veterinary Journal, London (1896, p. 177), says that the animals lose strength and condition, but the appetite remains good, except when the fever is very high, and even then green forage is eaten freely. The animals suffer greatly from thirst, and advantage is taken of this in administering medicine. Burke (1897, p. 191) states that the appetite is as good as in health. Lingard (1899, p. 60; 1900, p. 341) says that the appetite is ravenous. While in the horse the desire for food (also 1893, p. 70) usually ceases with supervention of fever, this disease is an extraordinary exception to the rule. In most cases, from the very onset of the disease until death, which may occur weeks or even months later, the animal may never cease to eat all the food placed before it, and in numerous cases under Lingard's observation the bedding was devoured during the night, the temperature at that time registering 41.2° C. (106.1° F.) or even as high as 42° C. (107.6° F.).

GURGLING.

From a very early period gurgling is present. In fact, it would not be overstepping the truth to say that this is a marked symptom in every case of this disease. It is frequently so pronounced as to be audible at some distance from the animal. (Lingard, 1893, p. 70.)

METEORISM, OR TYMPANITIS.

Meteorism is an occasional symptom which at times becomes sufficiently severe to require special treatment, but a brisk saline purgative is usually found to give great relief, though in some instances the symptom persists in spite of treatment. (Lingard, 1893, p. 70.)

RESPIRATION AND BREATH.

The respiratory movements are usually quickened from the first, sometimes out of all proportion to the pulse, so that they reach 60 to 65 in the minute, quite independent of any pulmonary complication. The respirations frequently appear to be entirely abdominal, and in these cases the ribs are not seen to move at all. It has frequently been noted that animals present a peculiar form of breathing when otherwise they appear fairly well, namely, eight or nine shallow respirations are immediately followed by a deep sonorous one, and this condition may last for several hours. Cheyne-Stokes[a] respiration was noted in one animal (No. 37) shortly before death. In this case the animal had, during the last few weeks of its life, suffered from severe kidney complications. (Lingard, 1893, p. 69.)

During the greater part of the period the disease lasts the breath is free from odor, but in the majority of cases, toward its last phases, it becomes very fetid, and in cases complicated with ozena; the mere name of ozēna is sufficient to describe the offensiveness of the discharge. (Lingard, 1893, p. 69.)

According to Griffith Evans (1881, p. 3) the breath sometimes smells bad. Nariman & Vaz (1893, p. 404) state that respiration is quick and there is much panting on the slightest exertion, the latter symptom being well marked and often the first symptom to attract the owner's notice; they also refer (p. 405) to the breath as fetid in advanced stages of the disease. The Veterinary Journal, London (1896, p. 178), says that the respirations are usually proportionate to the amount of the fever, but there is seldom much distress, although the lungs are occasionally found more or less affected, and toward the end the breath becomes very fetid. (For a clinical chart of the respiration, according to Lingard (1893), the reader is referred to page 76, under "Temperature," p. 74.)

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[a] A peculiar type of breathing in which there is a rhythmic increase of the respirations up to a certain degree of rapidity, then gradually decreasing again to temporary cessation. This pause may be as long as half a minute. This form of respiration is most commonly seen in the late stages of tuberculous meningitis, but it may also be noted in apoplexy, fatty degeneration of the heart, and nephritis with uremia.

HEART ACTION AND PULSE.

Griffith Evans (1881, p. 3) speaks of the pulse as being elevated, but a few days after admission to the hospital it lowers; (p. 4) in the last stages of the disease there is much anemic palpitation of the heart and the sound may be heard a little distance off.

Lingard (1893, pp. 68–69), in discussing the pulse and heart action, says:

"*The pulse.*—This is accelerated; it ranges between 30 and 90, and may reach 120 just before death, but varies considerably in the different types of cases recognized in this disease, not only in frequency but in rhythm and force. At the commencement the pulse increases in frequency upon the first rise of temperature, and continues to do so as long as the temperature becomes elevated during the latent period of the disease. On the appearance of the organism in the blood the pulse may fall somewhat, but again rises and remains so during the paroxysm of fever until the first apyrexial period, when it again falls to normal or thereabouts. A repetition of the above is observed in each fever and fever-free period until toward the termination of the case by death, when the pulse increases in frequency, and at the time of death may attain 120 beats to the minute, or even more. It will be of interest to examine the charts of horses Nos. 472 and 356 as examples of a point brought out by Steel, that 'the tracing from the number of pulse beats resembles that from thermometer readings.' In nearly every case of surra, at one period or another, and usually during one of fever, the pulse presents unmistakable signs of irregularity or intermission. I have noticed from one complete intermission in twelve beats down to as many as one in four; but in most instances a few hours later, or on the following day, no trace of irregularity existed. During a period of fever the pulse may vary considerably in frequency, according to the elevation of the temperature, with or without intermissions. The blood vessel during this time feels round and dilated with a moderate tension, the access of the pulsation is sudden and of short duration and its subsidence abrupt, but is fairly easy of compression between the beats, the walls of the vessel feeling smooth and elastic. But a marked change appears during an apyrexial period, the frequency is diminished or normal; in many instances there is some irregularity, or the pulse intermits; the beat is weak and thready, the access being gradual, its duration long and the subsidence slow, and the vessel feels flat, or, at the most, only half distended with blood.

"When the disease has been running on for a variable period, there comes a time, only a few days before death, when continued fever, usually accompanied by daily remissions, takes the place of the former type. During this period the pulse is increased in frequency, 65 to 72 beats per minute, regular, but bounding, forcible and large, reminding one of the force of the pulse of aortic regurgitations, but in surra the impulse is not visible in the carotids or in the superficial arteries. At the time of death the frequency of the pulse is greatly increased and may attain 120 or more beats per minute.

"*Action of the heart.*—As a rule there is nothing noticeable with regard to this organ until the disease is fairly advanced, when, after repeated attacks of fever, with the accompanying organisms in the blood, the animal becomes more and more dull and dejected in appearance. There is breathlessness on exertion, very often sleeplessness and inability to lie down, together with an incapacity for a sustained exertion. The heart's action then becomes exceedingly irritable, and at a later date, when the bounding pulse appears as a result of the condition of the organ, its action becomes violent and tumultuous, so that not only is the animal swayed backward and forward by it, but bystanders are able to hear the sounds at a distance of a few feet. At this time also jugular regurgitation is observed, and distention of the superficial veins of the body, particularly those of the head and the large external or subcutaneous thoracic vein, running from the flank toward the olecranon region."

For a clinical chart of the pulse, after Lingard (1893), see chart under "Temperature."

Nariman & Vaz (1893, p. 404) describe the pulse as frequent and soft. Later it becomes soft and irregular, often accompanied with palpitation of the heart. According to the Veterinary Journal, London (1896, p. 179), the heart action becomes irritable and (if the case is nearing a fatal termination) weak, with frequent and often distressful anemic palpitation.

TEMPERATURE.

Surra is characterized by an intermittent, remittent, and sometimes a relapsing type of fever, which continues for varying periods, from a day to months, according to the species and the animals attacked (Lingard, 1893, p. 1). In discussing the temperature more in detail Lingard (1893, pp. 67–68) says:

"In the following, for the sake of description, the peculiarities met with in the temperature will be dealt with—

"(I) During the latent period.

"(II) From the discovery of the hematozoon in the blood until death.

"(I) *Temperature during the latent period.*—Unfortunately we have no records dealing with the temperature of animals during the incubative period in naturally contracted cases of surra. We can, however, easily conceive the reason for this want, knowing, as we do, the insidious nature of the onset of the disease and the difficulty there is in deciding when any particular animal was exposed to the contagion. By experimental means, however, we are enabled to obtain an insight into this question, and on studying the charts presented with the following cases it will be found that the thermometric records present considerable variations, in that several different types of temperature curves will be observed during the abovementioned period.

"In one set of cases the temperature remains low for a few days and then commences to rise, the morning and evening reading being about half a degree Centigrade higher than that of the day preceding, but there being a temporary arrest or remission of 1.5° to 2° C. in the morning.

"In a second series of cases the curve delineated by the temperature readings presents for a varying period a diurnal variation, in some cases showing well-marked intermissions, in others hardly amounting to a remission; and these are followed by a sudden rise of temperature in a few just previous to or, in the majority of cases, subsequent to the appearance of the organism in the blood.

"In a third series the thermometer registers a normal or even subnormal temperature from the time of inoculation until the appearance of the organism in the blood, and this condition has occasionally been observed to persist after the discovery of the hematozoon.

"In a fourth series the temperature commences to rise either gradually or suddenly after inoculation, and attains a maximum varying from 39.2° to 41.2° C., which it maintains for a brief period. It then falls quickly or gradually to a normal or a subnormal minimum, either at the same time or just previous to the first appearance of the hematozoon in the gluteal circulation.

"(II) *The temperature from the discovery of the hematozoon in the blood until death.*—The type of fever appears to vary in different outbreaks of surra, changing according to the locality in which it occurs and the animal affected. In Burmah, Steel described the fever in mules as being of a relapsing type, and there is no doubt that the charts recorded in two cases of the naturally contracted disease bear out his opinion.

"In the cases which have come under our observation animals suffering from the naturally contracted and inoculated disease present at least two varieties of types:

"(1) A continued fever accompanied at tolerably frequent intervals by remissions more or less marked, and after a varying period of days by an intermission of longer or shorter duration. These changes may be repeated several times in the course of the disease. When, however, it arrives at its last stage the thermometer reveals a continued high temperature of a remittent type, or one characterized by morning remissions, and evening exacerbations until death.

"(2) A second and much rarer form is one which may be conveniently divided into three stages. In the first a continuous fever, accompanied by remissions, is present for some days. This is followed by a succession of periods lasting two to five days, each individual period being made up of a gradual or more sudden rise from the normal to 40° or 41° C., or even higher, when it attains a maximum, and after a short time is followed by an abatement of the fever, indicated by a sudden fall in temperature from 2° to 4° C., which may become normal or subnormal, and on such occasions this is succeeded by a period of apyrexia. In the third stage the fever may again take on a continued type, which is not always continuous, but remains high and oscillates freely until death.

"(3) Cases may be rapidly fatal with the temperature remaining subnormal during the whole course of the disease. Vide cases Nos. 32 (35.4° to 38° C.), 30 (35.7° to 38.8° C. just before death), 41 (35° to 37.6° C.), 27 (normal and subnormal, never over 38.7° C.).

"In some instances there may be a sudden rise in temperature just before death, but in the majority of cases there is a fall. In 30 cases under our observation death was followed in 18 by a fall in the temperature varying between 0.5° and 3°C., in 10 by a rise varying between 0.5° and 4° C., and in 2 neither rise nor fall took place."

Burke (1888a, p. 2), in referring to fever, says that its periodicity is perhaps the most characteristic feature, but it is after all an uncertain guide.

The temperature does not often rise above 104° F. (110° F., Steel, 1886a), and may fall as low as 97°. The highest temperature may be followed by a gradual fall and may rise again gradually, until after an interval of 5 or 6 days, the maximum is reached, then there is a fall, or there may be diurnal exacerbations, recalling the temperature chart of malaria in man. Burke (1897, p. 191) remarks that in some cases "the symptomatic course of the disease is very clearly and definitely marked, the first thing, of course, being the recurring elevation of temperature which is so clearly observed in the human subject." Pease (1897, p. 555), on the other hand, remarks that while *Plasmodium malariæ* causes a distinct intermittent fever, *Trypanosoma* does not, and there is no regularity in the course. In malaria the stadia are short and sharp, lasting but a few hours, while the fever of surra lasts for days, and for extremely irregular periods of time in the course of the same case. Nariman & Vaz (1893, p. 404) speak of the high fever which is periodical, the exacerbations lasting from 5 to 7 days, while the intervals are little shorter. In exceptionally severe cases the exacerbations run to even 10 days, while in mild cases they may not be more than 3 days in duration. Further, it is only during the febrile periods that the other symptoms are marked, but between times the animals are dull and drowsy.

A few days after admission to the hospital the activity of the fever subsides, pulse lowers, and temperature becomes normal.

According to Lingard (1899), the following variations in the temperature of healthy animals were observed at the Imperial Bacteriological Laboratory in India:

Animal.	Centigrade.	Fahrenheit.	Animal.	Centigrade.	Fahrenheit.
Horse	37.2 to 38.3	99 to 101	Cat	37 to 38.6	98.6 to 101.5
Donkey	35.8 to 36.6	96.4 to 97.8	Rabbit	38.8 to 39.8	101.8 to 103.6
Ox	37.7 to 38.3	100 to 101	Guinea pig	38.4 to 39.4	101.1 to 103
Sheep	39.4 to 40	103 to 104.7	Fowl	41 to 42.6	105.8 to 108.7
Goat	38.8 to 40.2	101.8 to 104.3	Pigeon	41 to 43	105.8 to 109.4
Dog	37 to 39.8	98.6 to 103.6			

For horses suffering from surra Griffith Evans (1881, 1882) gives a number of tables of temperature and pulse.

Lingard (1893) gives numerous charts of temperature, pulse, respiration, and hematozoa, from which plates IX to XV are reproduced for this report.

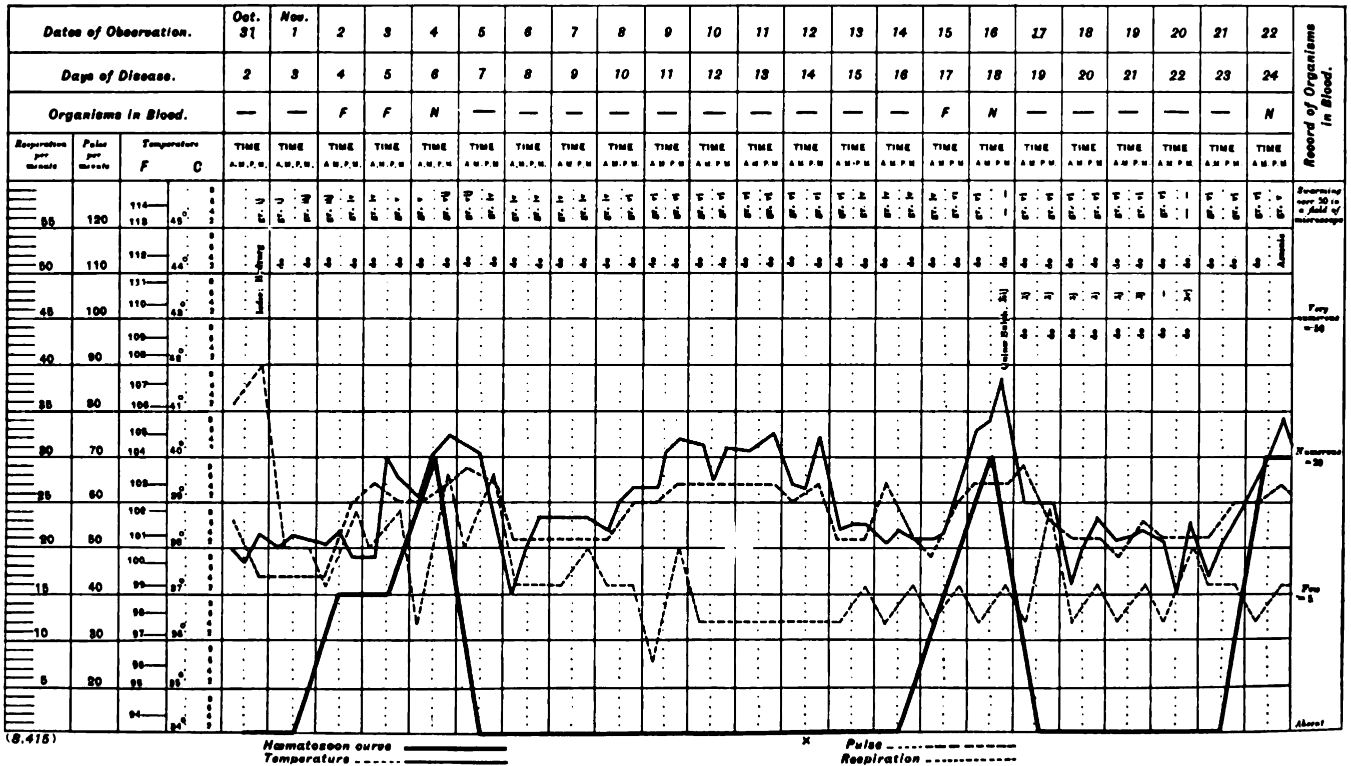
Two further temperature charts are here added, based upon the observations of still a third observer, Pease (1897, pp. 562, 564).

For comparison with these charts of the horse, the following observations on a mule, by Steel (1886a, pp. 171–172), may be noted:

> "In the mule there are certain peculiarities of different cases worthy of note: A. Mule No. 13.—Experimentally I obtained the most typical chart from a case induced by the administration of mixed blood (containing spirilloids) and water as a drink to a thickset mule in good condition. The effects were as follows:
>
> "(*a*) An evanescent rise in temperature of nearly 2° on the evening of experiment.
>
> "(*b*) An *incubation* of 6 days.
>
> "(*c*) On sixth day after inoculation the *invasion* rise began; it was 5° the first day, one-half degree in 2 successive days (eighth and ninth) to 105°, a fall of 2° on tenth day, of over 3° *to the normal* on eleventh day. No appreciable rebound.

Australian Gelding ——— *Age, 7* ——— *Sex, Gelding* ——— *Colour, Brown* ———

Disease, "Surra" naturally contracted. ——— *Date of Attack, 30. 10. 92* ——— *Result, Death* ——— *Date of Result, 17. 2. 93* ——— *Register No.* ——— *LXXIII* ———



× *Inoculated 3 Guinea Pigs with blood*	(I)	*Blood 0-2 c.c.*	*Inoculated on 12th. November 1892.*	*The hæmatozoon appeared on*	*29th. November 1892.*	*Latent period-*	*17 days.*	*Death*	*4 Dec. 1892*		*Days*	*22*
	(II)	" *0-25 c.c.*	"	"	*24* "	"	*12*	"	*25 Feb. 1893*		"	*105*
	(III)	" *0-3 c.c.*	"	"	*24* "	"	*12*	"	*12 March 1893*		"	*120*

FIG. 89.—TEMPERATURE CHART OF SURRA DISEASE OF HORSE.

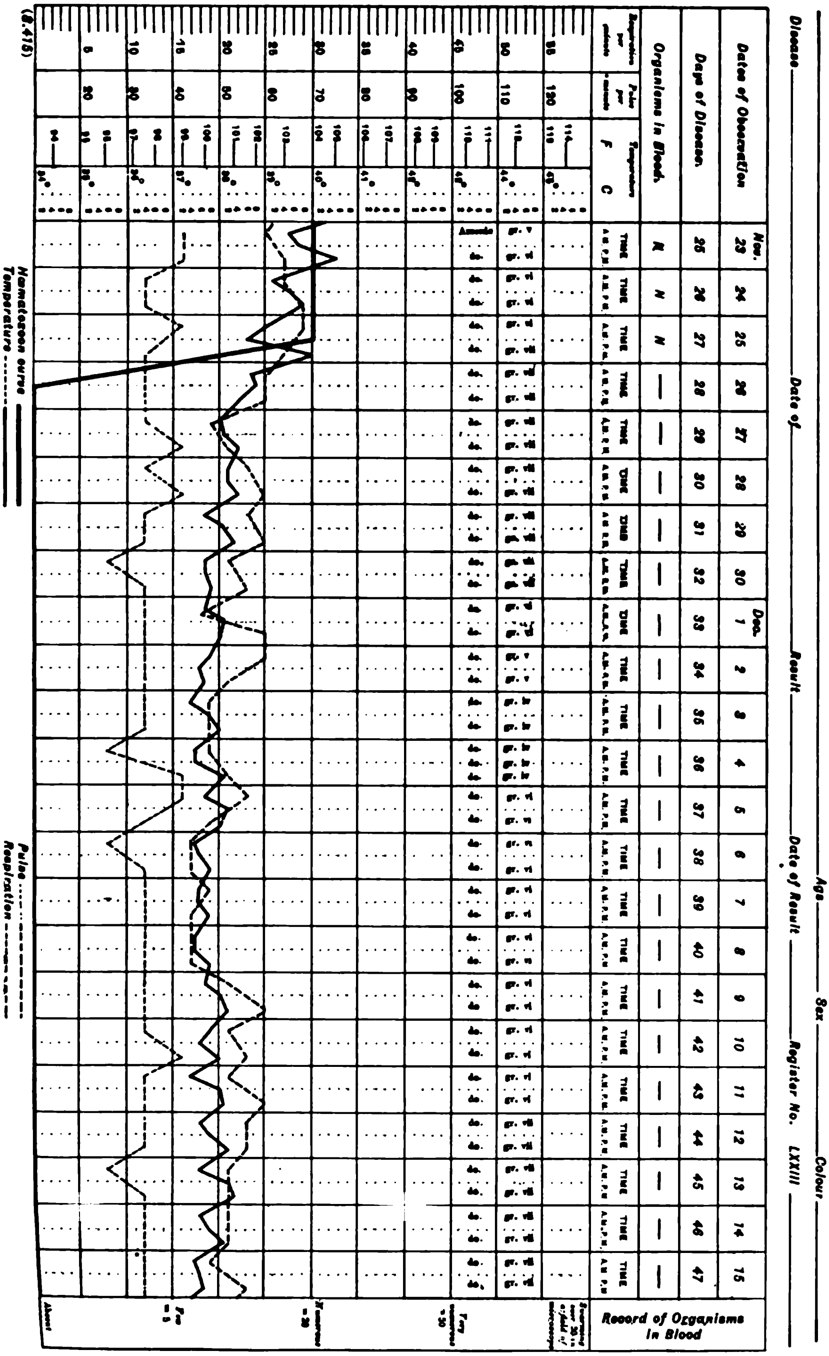


FIG. 90.—TEMPERATURE CHART OF SURRA DISEASE OF HORSE.

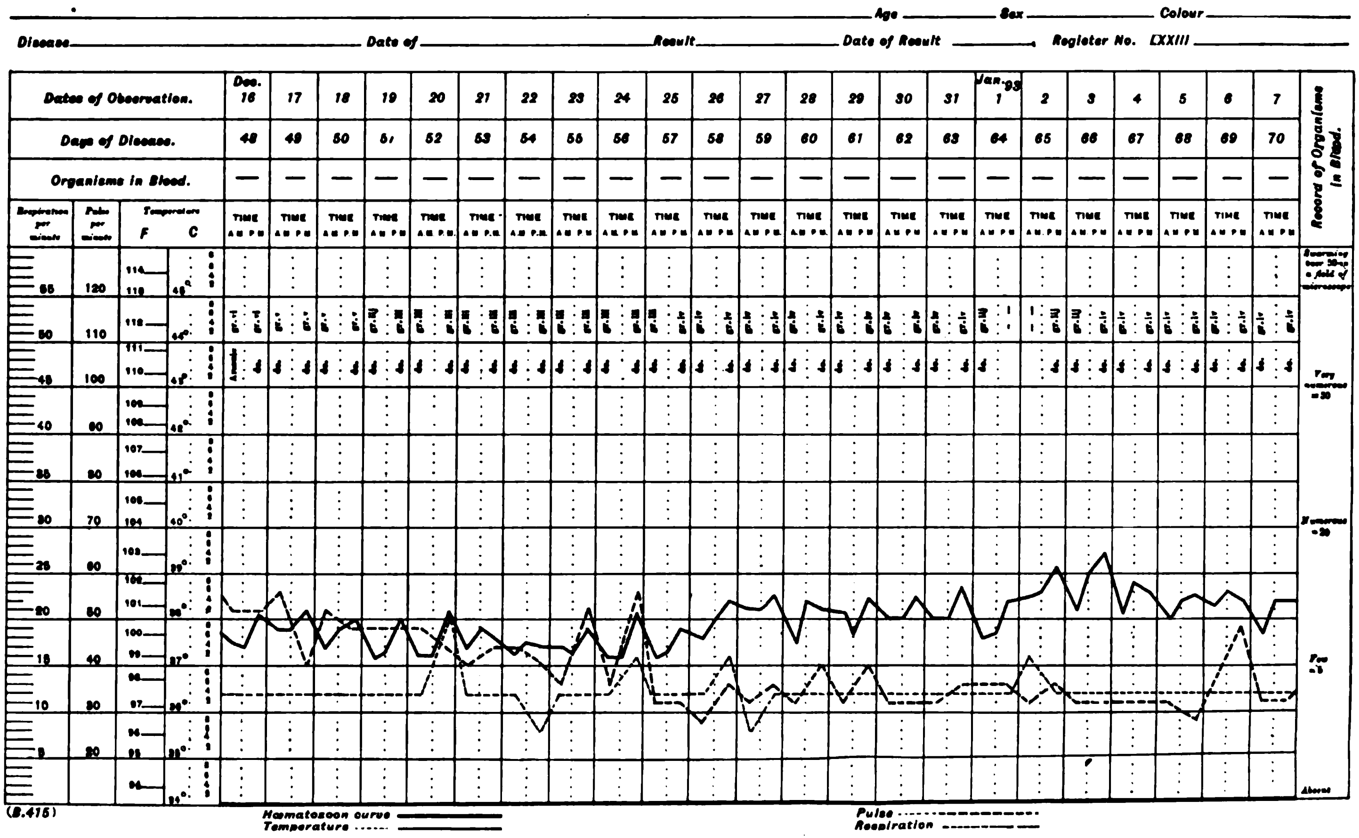


Fig. 91.—Temperature Chart of Surra Disease of Horse.

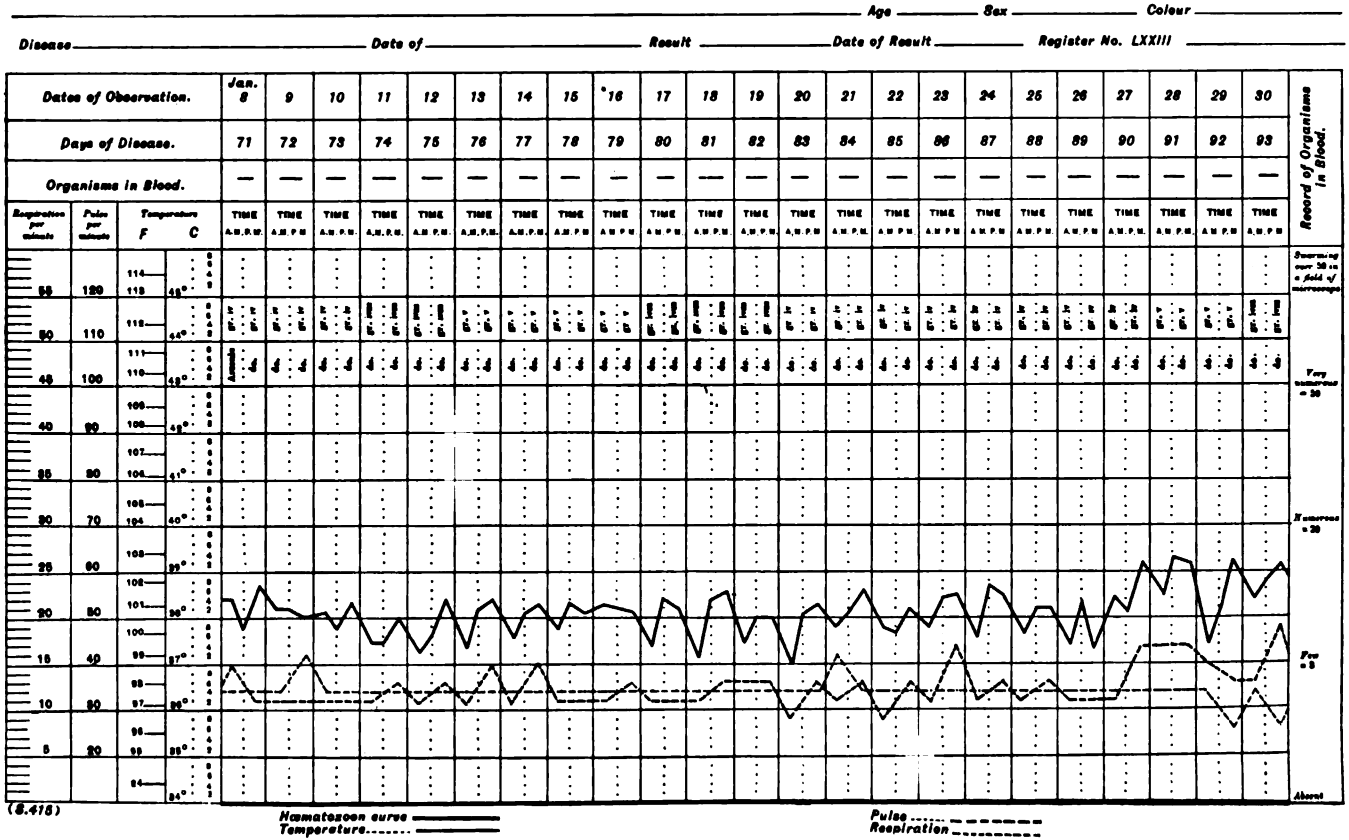
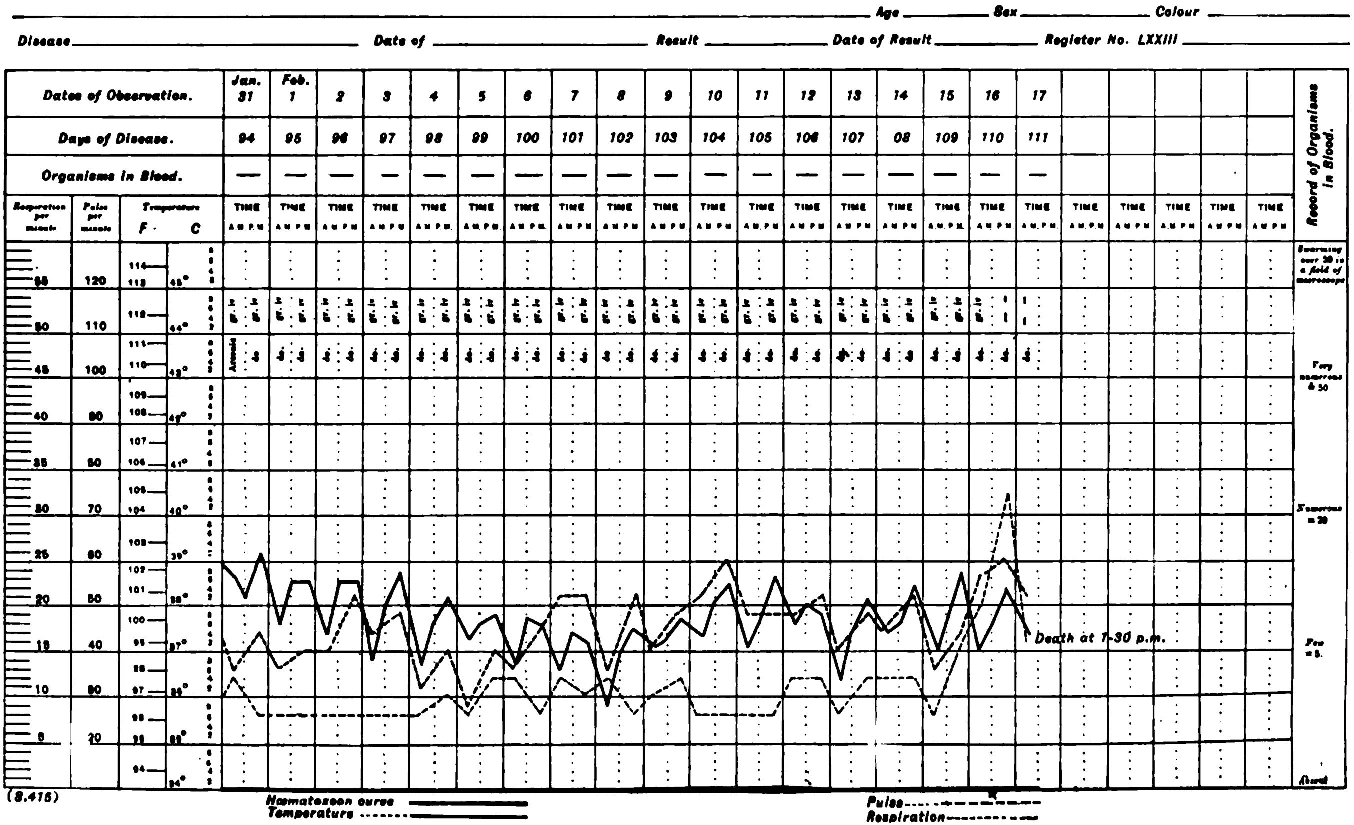


FIG. 92.—TEMPERATURE CHART OF SURRA DISEASE OF HORSE.

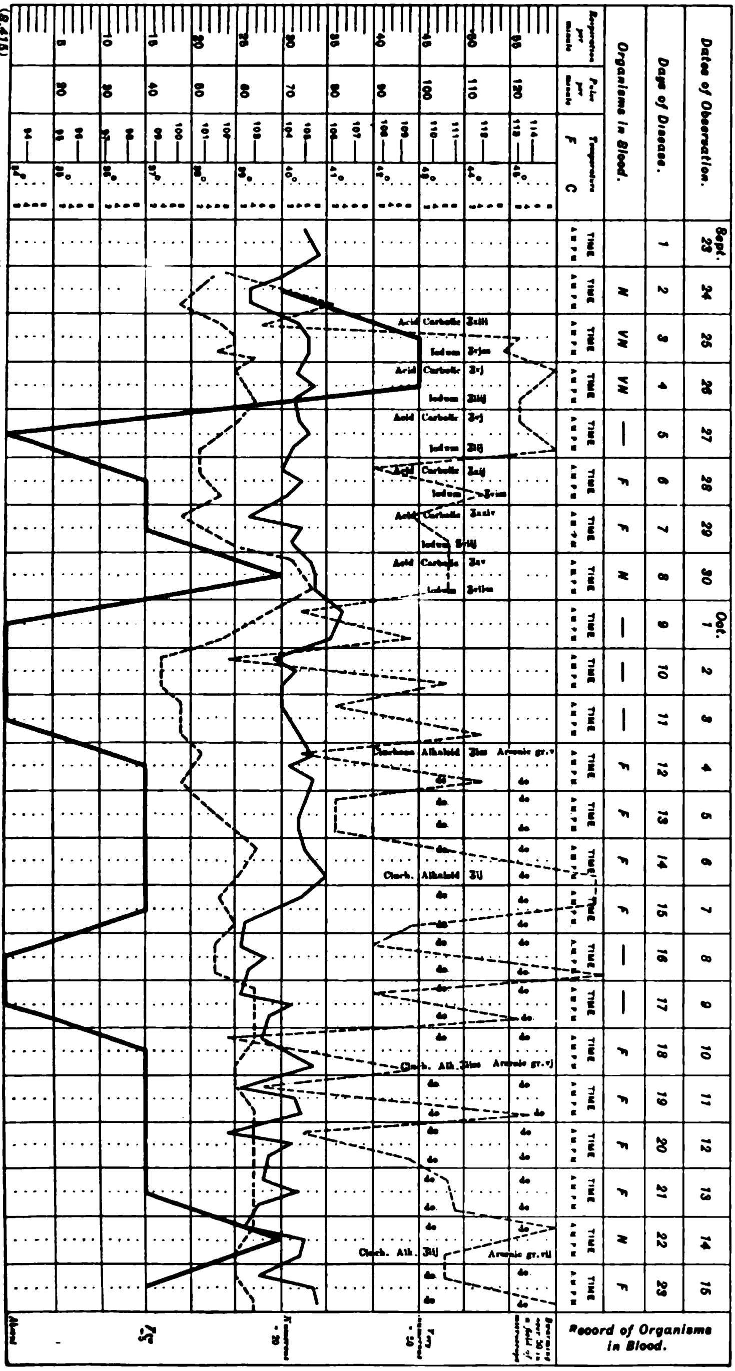


× Inoculated two Guinea Pigs. } 16.2.98. (I) Blood 0·5 c.c. (II) " 0·5 c.c. } Hæmatozoon absent.

FIG. 93.—TEMPERATURE CHART OF SURRA DISEASE OF HORSE.

Australian Gelding ——— *Age, Aged* ——— *Sex, Gelding* ——— *Colour, Grey* ———

Disease, "Surra" naturally acquired ——— *Date of Attack, 23rd. Sept. 1892* ——— *Result, Death* ——— *Date of Result* ——— *Register No. LXX.*



Hæmatozoon curve ———
Temperature ......
Pulse - - - - -
Respiration -.-.-.-

FIG. 94.—TEMPERATURE CHART OF SURRA DISEASE OF HORSE.

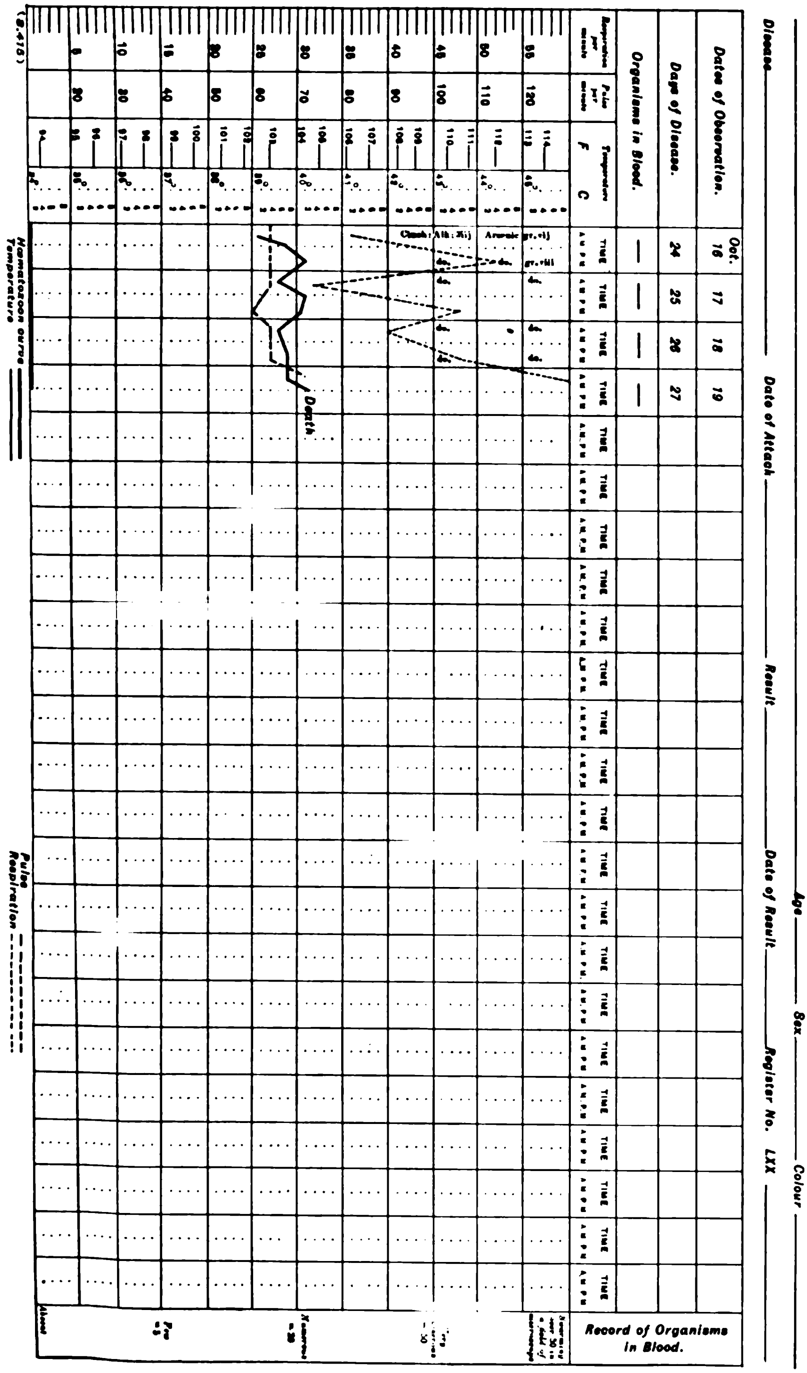


FIG. 95.—TEMPERATURE CHART OF SURRA DISEASE OF HORSE.

"(*d*) *First fever-free interval* of two days (twelfth and thirteenth).

"(*e*) *First relapse.* A rise through 3.5° first day, 1° second day, 2° third day, to a maximum of 106.5° F. A fall through 4° on first day and 2.5° on second day *to the normal.*

"(*f*) *Second fever-free interval* of 2 days.

"(*g*) *Third relapse.* Rise through 1.5° first day, one-half degree second day, one-half degree third day, to 102.5°. The reading remains here for fourth day, and then on fifth day falls to normal, and on sixth day *below normal.*

"(*h*) A slight *rebound* on seventh day, then fall to below normal.

"(*i*) *Two days interval,* below normal.

"(*j*) *Fourth relapse.* Rise through 1° on first and 3° on second day to 103°, a fall of 2° daily to normal on second day.

"(*k*) The temperature remains normal 1 day (thirty-fourth after inoculation).

"(*l*) The next 9 days are occupied by three acute rises to 103°, 104°, and 104°, respectively, separated by two imperfect falls to 100° on third day and to 101° on fifth day. On the ninth of these days the reading is a little below the normal.

"(*m*) It remains so 1 day.

"(*n*) The next 6 days occupied by three rises and three falls on alternate days (104/100), (102/101), (102/99).

"(*o*) The temperature remains about normal 2 days, then rises 2 days through 103° to 103.5°, falls to 101°, rises to 102°, falls to 99.5°, rises to 105.5°. Then falls in 2 days (through 101°) to 99°.

"(*p*) It rises to 101° next day, remains so 1 more day, then up to 103°, down to 101°, up to 105°. Then a marked fall to 98.5°.

"(*q*) Rise to 99°; rise to 105°; fall to 100.5°; remains so for 2 days.

"(*r*) Rise to 105°. Then fall for 3 days (102°—99°—to 98°); remains so 1 day.

"(*s*) Rise to 104°; fall to 101°; remains so 1 day.

"Observation ceases after 83 days from rise. The deductions to be made from this prolonged record are that after an incubation of 6 days three fever phases can be observed, each consisting of a rise for 3 days and a fall for 2 days, and these are separated from each other by intervals of 2 days, during which the temperature regains the normal. Then occur less regular rises, variable in degree, and separated by depressions variable in degree, but seldom below the normal until toward the last. There is a tendency of the rises to group in threes. The parasites were in this case most often found at the periods of most fever. It is hardly practicable to determine the number of relapses here. The case was 77 days under observation after the first rise of temperature."

PATHOLOGY.

Postmortem examination does not reveal any structural disease (Griffith Evans, 1881, p. 6). No structural changes were noticed in the kidneys, liver, spleen, heart, lungs, and mucous membrane of the stomach and intestines. According to Lingard (1893, p. 2), there is no specific lesion present; (p. 80) the most important element is the presence of actively moving parasites in the blood.

RIGOR MORTIS.

Rigor mortis is normal, and carcasses of animals which have died of surra present a dreadfully emaciated appearance, seeming to be composed of only skin and bones (George H. Evans, 1899, p. 38).

ANEMIA.

According to Griffith Evans (1881, p. 3), the membranes are blanched. Burke (1888a, p. 3) says there is marked anemia and leucocytosis; (p. 8) extreme pallidity of all the tissues, with perhaps a trifling serous effusion into the abdomen. Later (1891, p. 270; 1897, p. 188) he states that very often there is an acute dropsy, with no other postmortem lesions save extreme anemia and yellow staining of the tissues, due to fatty degeneration.

SEROUS EFFUSIONS.

According to Griffith Evans (1881, p. 6), there is more or less clear serum effused into the peritoneal cavity in all cases, with a slight coating of lymph upon the parietal layer, but there is no sign of any inflammatory action; it is a simple exudation. There is no abnormal effusion in the pleural cavity, but in one case the pericardial sac was greatly distended with fluid. According to George H. Evans (1899, p. 38), there may be an excess of fluid in the abdominal and thoracic cavities, also in the pericardial sac.

PETECHIÆ.

Griffith Evans (1881, pp. 6–7) says that in some cases petechiæ were found on the mucous lining of the intestine similar to those on the vagina and eyelids. According to Steel (1886a, p. 169), the petechiæ seem to appear when the temperature curve begins to fall and the parasites have attained their maximum activity and frequency. The skin occasionally, and the mucous membranes of the mouth and nostrils frequently, are the seat of petechiæ and of very limited degenerations from malnutrition, probably the result of plugging of their small nutrient vessels. We see this plugging on a much larger scale bringing about a defective supply of blood to the limbs, especially the hind ones, for antemortem clots are frequent in this disorder, and may prove the immediate cause of death. The Veterinary Journal, London (1896, p. 181), reports petechiæ on the kidneys. Hayes (1898, p. 481) says there are petechiæ on various internal organs.

JAUNDICE.

According to Griffith Evans (1881, p. 4), the yellowness of the mucous membranes, or jaundice, and the petechiæ remain throughout, though they are variable in intensity.

Lingard (1893, p. 70) says that tingeing of the membranes is a very constant symptom in every case at one period or another. It sometimes is a very early one, and at others does not make its appearance until well on in the disease. It may be evanescent in character, appearing with each paroxysm and gradually fading during the intermission, until the membranes become perfectly free and pallid, only to return with each exacerbation of the fever. In a second series of cases the color is intense and persists until death, when the tissues of the body will be found to present a deep crude gamboge color. Even when there is little or no tingeing of the mucous membranes at the time of death the gelatinous exudation found so constantly in this disease is always more or less tinged from a light yellow to a deep orange color, and the material surrounding the base of the heart may be specially mentioned as being one of the most certain localities in which to observe it. Nariman & Vaz (1893, p. 404) say there is a well-marked jaundice denoted by the yellowness of the membranes.

FATTY CHANGES.

Burke (1888a, p. 3) states that there is fatty degeneration of the muscles, liver, spleen, kidneys, and other organs. Later (1891, p. 270; 1897, p. 188) he says that there is a large deposit of fat all over the body, especially noticeable under the skin. This gives the tissues a peculiar, jaundiced appearance, which is shown under the microscope to be due to the deposition of fat globules.

ORGANS AND TISSUES.

MUCOUS MEMBRANES.

According to Griffith Evans (1881, pp. 6–7), the mucous membranes everywhere are more or less tinged with yellow, and often the subperitoneal connective tissue is yellow also. According to Hayes (1898, p. 481), the mucous membranes and other tissues are frequently tinged yellow with coloring matter of the bile. (See also "Eyes," p. 64; "Nose," p. 65; "Mouth," p. 67; "Vulva," p. 67; "Stomach," p. 84; "Intestines," p. 85.)

HEART AND BLOOD VESSELS.

Steel (1886a, p. 171) records fatty changes in the heart. He also refers to "green gelatinous extravasations between the muscles of the thighs; greenish white blood clots in the larger blood vessels (a short time after death); antemortem clots, especially in the large blood vessels of the hind limbs."

Lingard (1893, pp. 82–83) gives the following lesions for the heart:

> "The cavity of the pericardium generally contains more or less fluid presenting an amber or orange color, and in severe cases it is found deeply tinged with blood. Pericarditis has not been observed.
>
> "*The heart* generally presents some abnormal appearance. The base is frequently the seat of a yellow or orange-colored deposit of gelatinous exudation, which takes the place of the usual fat. This exudation in the great majority of cases is dotted over with small circular ecchymoses, dark red or nearly purple in color, which lie under the visceral pericardium singly or in groups, and sometimes assume the pro-

portions of extravasations. These are also found, but less frequently, invading the external surface of the muscular tissue of the organ, and a common situation for them also is on either side of the coronary vessels.

"The right side of the heart is in most instances dilated, the left side contracted. The muscular tissue is often pale and flabby, and in a state of fatty degeneration.

"The cavities of the right side of the heart, and much less frequently the left, are distended with clots, which present a variety of colors ranging from yellow or orange to green and dark purple. These may be found bathed in dark semifluid blood. These coagula run up the great vessels from the cavities of the organ, and on gentle traction can be detached, and are found to reproduce the branching and peculiarities of the vessel which they occupied. The lining membrane of the right auricle and ventricle, and much less frequently the cavities on the left side, are observed to be stained a dusky red or claret color; but the pathological change, which gauges the gravity of the disease in each individual case, must be looked for and estimated by the number and extent of the subendocardial extravasations. These in cases under treatment, when the hematozoon has been absent for some 10 days, have been found to be entirely absent. In other cases they may be represented by a few petechiæ, and again in more severe attacks extensive extravasations of blood may be present. These subendocardial changes are usually more frequently present in the right ventricle than in the left, and have been noticed in the cavities on the right side of the heart, when they have been entirely absent from the left. They are least frequently found in the left auricle. A common situation for them to occupy is the surface of the musculi papillares, but they may appear on any portion of the muscular wall of the cavity, as well as frequently involving the inner surface of the flaps of the tricuspid and mitral valves. The ventricles occasionally present well-marked signs of fatty degeneration, and, although in the human being the left is the more frequently affected, in these cases the right ventricle has been observed to present the most marked changes, near to the apex of the organ. In cases where the visible mucous membranes have been stained yellow during life, the same coloration of the tissues of the internal surface of the heart has been found well marked. In all the cases the yellow deposit of gelatinous material was present round the base of the organ.

"*Naturally contracted.*—In four of these cases ecchymoses or more extensive extravasations were found on the external surface, lying under the visceral pericardium and well marked in one. Subendocardial extravasations were present on the bicuspid valves in Nos. 56 and 70, and involving the tricuspid valve in No. 70.

"*Inoculated cases.*—In 12 cases ecchymoses were present on the external surface of the heart and internal subendocardial extravasations, as follows:

"In the right auricle, in 2; in the right ventricle, in 12; in the left auricle, in 3; in the left ventricle, in 14.

"The musculi papillares were involved in 4 cases."

Nariman & Vaz (1893, p. 405) also mention gelatinous yellow deposits in the furrows of the heart and often extensive petechiæ under the endocardium. Hayes (1898, p. 481) says there is a yellow or amber jelly-like exudate in the connective tissue of the throat, chest, abdomen, and about the muscles and other tissues, and especially around the base of the heart.

According to George H. Evans (1899, p. 38) the heart has gelatinous accumulations in its furrows instead of fat. In chronic cases the organ is pale, flabby, very often enlarged, and very soft. The cavities are filled with blood or variegated clots, which extend into the great vessels. On several occasions he has observed an atheromatous con-

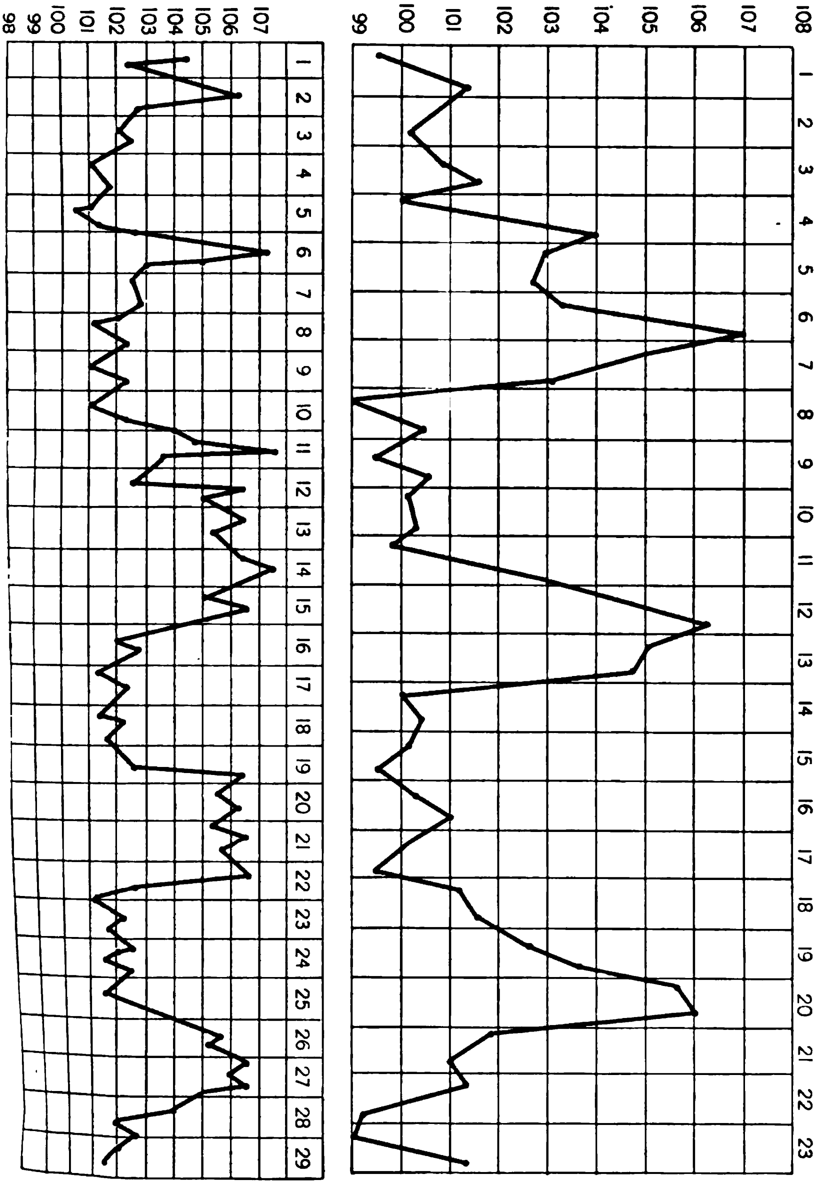


FIG. 96.—SURRA FEVER IN THE HORSE.

dition of the aorta. The heart constantly presents some abnormal condition, the more frequent being more or less extensive subendocardial ecchymoses.

At the base of the heart there is almost invariably a yellow deposit of orange-colored gelatinous material, and the cavities of the heart contain clots of a yellow, green, orange, and purple color, bathed in tarry dark blood. (Vet. J., Lond., 1896, p. 181. See also p. 62, under "Edema.")

Blood, anemia, leucocytosis, and parasites.—According to the more careful observers, there are three things in particular to be noticed in connection with the blood, namely: (1) The presence of the parasites, (2) a destruction of the red-blood corpuscles, and (3) a marked increase of the white corpuscles. Steel (1886a, p. 169) says that frequent dropsies and sluggish vitality of all the tissues indicate the depraved state of the blood. Burke (1888a, p. 9) states that leucocytosis is characteristic of surra, being always present in typical cases.

The Veterinary Journal, London (1896, p. 178), records that at first the blood appears normal, but later a peculiar vibration may be observed, caused by some rapidly moving indefinable organisms among the corpuscles. Later the white corpuscles increase in number, and the red corpuscles, from the attacks made upon them by the hematozoa, become irregular in shape, many of them appearing to be irregular granulated gelatinous masses of a pale color, which form into irregular rouleaux. In the last stages of the disease the plasma occasionally assumes a faint rusty tinge; the parasite attacks the red corpuscle, takes hold of it, tears it, and worries it as a dog would a rat. Griffith Evans (1881, p. 181) records that the hematozoa always fasten to the blood corpuscles by their blunt end, showing a great preference for the concave side of the disk rather than the edge, and breaking up the corpuscle. Burke (1888a, p. 84) and others also describe the attacks on the corpuscles as being a tearing, dragging, or tugging. The white corpuscles are said not to be attacked by the *Trypanosoma.* Lingard (1893, p. 28) estimates as many as 300,000 parasites for 1 c. c. of blood. Nariman & Vaz (1893, p. 405) say that the corpuscles appear to be broken, and many small granules are seen, some of which are freely movable. No parasites were found in the secretions. Nariman believes that between the febrile attacks the hematozoa accumulate in the liver and spleen; for after death, when no parasites are seen in the blood, examinations of scrapings from both liver and spleen show fast-moving round bodies, like the corpuscles. Ranking (1891a, pp. 400–401), who did not admit that surra was due to *Trypanosoma*, and who considered a "bacillus" as the exciting cause, claimed to have noticed "very characteristic changes" in the blood corpuscles. He says:

"*Echinosis.*—At one period they present a peculiar appearance, to which I have given the name of echinosis, for the reason that the individual corpuscles have lost their normal contour and resemble nothing so much as an *Echinus.* * * *

"*Plasmodic.*—At another period, or in some corpuscles at the same period, the interior of the corpuscle is seen to be occupied by a foreign substance presenting ameboid movements and of very various forms, varying from circular throughout stellate and pileate forms to a veritable bacillar form—straight, curved, or spiral. These bodies, I take it, are comparable to, if not identical with, the *Plasmodium malariæ* of Marchiafava and Celli, as they correspond in all particulars, both of morphology and development, with those organisms. In one specimen only have I found the spirillum (*Hæmatomonas*) (*Spirochæt*), hitherto considered to be the effective cause of surra; whereas the organism, whose nature is now described, is invariably present and conforms in all particulars to Koch's postulates. * * *

"*Echinoid stage.*—The blood, then, of a surra animal, when in the stage of 'echinosis,' contains red cells, to the surface of which are adherent, or in the substance of which are embedded, minute circular organisms varying in size from 0.0004 mm. to 0.002 mm. in diameter. * * *

"In some stages these circular organisms, which I shall for the future call 'spores,' are seen free in the plasma in variable quantities exhibiting actively motile properties. They attach themselves to the surface of the red-blood disks, giving rise to the 'echidnoid' corpuscles of early echinosis.

"*Plasmodic stage.*—After a variable time the cells lose their *echinoid* appearance and become *plasmodic;* that is to say, they become occupied by the bodies mentioned above, and compared to the *Plasmodium malariæ.* These plasmodic corpuscles are of irregular contour in most instances, only retaining their disk shape in those cases in which the plasmodium is circular; in other cases assuming more or less the shape of the plasmodium contained in them.

"*Spore stage.*—After a further period the plasmodia break up, undergoing rapid fission into 'spores,' 0.002 mm. in diameter, which escape from the blood cell causing 'late echinosis,' and become free in the plasma. The changes must be observed on a warm stage.

"The red cell, having lost the spores, almost immediately resumes its normal contour, but only for an instant, as it rapidly loses all coloring matter and becomes translucent and all but invisible. These decolorized red cells may again be brought into view by adding a little watery Spiller.

"If now a slide, in which these appearances have been watched, is treated in the usual way for staining spores, it is seen to be full of minute deeply stained spores in a fibrinous reticular stroma, to the meshes of which the spores adhere.

"In addition to the above organisms, the following objects are seen with varying frequency:

"(*a*). Colorless wandering masses of plasma ovoid in shape and beaked or flagellate at either pole, measuring .004 mm. in diameter. These stain with Spiller.

"(*b*). Ordinary leucocytes.

"(*c*). Large irregularly globose leucocytes, mono- or poly-nuclear, in many cases containing the above beaked plasmodia (*a*), and frequently full of motile spores. These are evidently phagocytes.

"(*d*). Mulberry-shaped globose masses of yellow spores. These I have reason to believe are aggregations of spores in phagocyte cells, as they are more common when the animal is evidencing a resisting power against the disease, and may be observed in various stages of development.

"(*e*). Pigment granules solitary or in phagocyte cells.

"(*f*). Fusiform bodies .016 mm. in length, yellow, with white contents separated into two triangular segments, with the bases centrally placed, resembling the bodies figured by Golgi as one stage in the development of Laveran's parasites."

Ranking further says that the blood of ague conforms in pathological appearances with that of surra and an identical bacillus can be obtained.

ORGANS OF RESPIRATION.

Larynx.—The larynx usually presents nothing abnormal. (Lingard, 1893, p. 83.)

Trachea.—The trachea is sometimes the seat of congestion, and contains a quantity of frothy mucus. (Lingard, 1893, p. 83.)

Bronchi.—The bronchi are usually healthy, but occasionally present the signs of bronchitis, or contain purulent material when pneumonia is present. (Lingard, 1893, p. 83.)

Pleuræ.—The pleuræ rarely present signs of inflammation (case No. 8, however, showed signs of recent changes), but sometimes petechiæ are seen lying under the parietal pleura. The pleural cavity seldom contains any fluid, but in three cases several ounces were found in each. (Lingard, 1893, p. 83.) (See also "Serous effusions," p. 78.)

Lungs.—In one case Griffith Evans (1881, pp. 6–7) found the margin of one lobe of a lung hepatized. Steel (1886a, p. 171) records congested lungs. Lingard (1893, pp. 83–84) states that the most common morbid appearances in surra, according to frequency, are emphysema in nearly all ecchymoses lying under the visceral pleuræ, and a localized pneumonia is by no means uncommon. In one case bronchopneumonia was present, but in all the other twelve the lobules were surrounded by a gelatinous exudation, the change resembling pleuropneumonia of cattle. In a large majority of horses examined postmortem the lungs presented calcareous bodies situated rather superficially or in the depths of the tissues, exactly similar to those found in the liver. These are due to some cestode, and the changes are of earlier date, before the contraction or inoculation of surra.

According to the Veterinary Journal, London (1896, p. 181), the lungs are often emphysematous and sometimes the seat of local inflammation, while Hayes (1898, p. 481) says that the lungs often show signs of inflammation.

According to George H. Evans (1899, p. 38) the lungs are healthy as a general rule, but cases in which they are congested are by no means infrequent.

LYMPHATIC GLANDS.

The lymphatic glands throughout the body are more or less swollen and more or less edematous. (Burke, 1891, p. 270; 1897, p. 188.)

According to Lingard (1893, p. 82), the mesenteric glands are not enlarged as a rule, but abnormal appearances were noticed in one case.

ORGANS OF DIGESTION.

Mouth and tongue. (See p. 67.)

Pharynx and esophagus.—The pharynx and esophagus rarely present any abnormal appearance, but if any are present in the latter organ they are usually small wounds in the epithelium due to the presence of *Gongylonema scutatum*.[a] (Lingard, 1893, p. 69.)

Peritoneum.—Symptoms of old circumscribed inflammation are visible in most cases as perihepatitis and occasionally perisplenitis, the organ being firmly attached to the stomach or to the parieties, but in no single instance has Lingard (1893, p. 82) observed any signs of a general peritonitis.

Mesenteric glands. (See "Lymphatic glands," p. 83.)

Stomach.—According to Steel (1886a, p. 170), gastric ulceration occurs in three-fourths of the cases, especially on the cuticular portion of the stomach; occasionally, also, the villous portion was affected. The ulceration in some cases extended to perforation. It was brought about by a peculiar yellow degeneration of the tissue, and is probably due to embolic plugging of the small blood vessels.

Burke (1888a, p. 5) states that gastric ulcers were frequently observed in the transport mules in the Burma outbreak, and, by way of comparison, he refers to the presence of similar lesions in chlorotic women. Such ulcers do not, however, appear to be present in all outbreaks. Later, Burke (1891, p. 270), in discussing ulcers, says that "the blood itself is rendered unfitted for the purposes of proper nutrition, and degenerative changes of an adipose character, sometimes leading to disintegration of portions of the imperfectly nourished tissue, take place. When organs and parts so weakened by starvation are distended with anemic blood which they can not utilize, sloughs result from gangrene of the imperfectly nourished tissues, as evidenced in the ulcerations of the stomach, etc., noted in this disease. The ulcer itself, once formed, suffers from nutritional defect, owing to the impoverished state of the blood, which prevents the formation of resisting tissue around it, and often leads to perforations."

Gunn states that the villous portion in these cases remained unaffected. In no case was ulceration to be seen, but the cuticular portion of the stomach was much thickened, and on the internal surface were observed numerous papillary eminences, each having a small and somewhat deep central depression.

Lingard (1893, p. 81), in referring to his own investigations, says:

> "In this investigation, in the majority of cases, the cuticular portion of the stomach has practically been found free from grave complications.
>
> "In 1 case the cuticular portion of the organ was described as thickened, but inexperience at that early period of the research probably led one to overlook the fact that the coats were merely contracted. A partial yellow coloration of the lining membranes, either only involving the left sac or in others staining both sides of the line of demarcation, was noted in 1 naturally acquired case of the disease and in 5 inoculated cases, and congestion of the cuticular portion was found once.
>
> "The villous portion of the right sac was much more frequently found to be the seat of marked changes.

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[a] This is a threadworm which burrows undulating tunnels in the epithelium of œsophagus. It is very common in cattle in the United States.

"Ulcers occurred in 2 cases and were probably due to the effects of parasites; congestion, only in 14—3 in naturally contracted cases, 9 in inoculated animals from horse to horse, and 2 through the goat.

"Petechiæ in 1 naturally acquired and in 3 inoculated. In 1 inoculated case extravasations of blood were present, and small, round, elevated white patches in 1 naturally contracted case. With regard to parasitical tumors, due to the presence of large numbers of the *Spiroptera megastoma*, they were present in 3 naturally acquired cases, whilst in inoculated cases from horse to horse they were observed in 23, and from goat to horse, etc., in 2; and in case No. 33, an extravasation of blood had occurred beneath the mucous and muscular coats."

George H. Evans (1899, pp. 37–38) in referring to surra says that—

"with regard to the postmortem appearances of this disease in Burma, one lesion is rarely if ever absent, namely, some change in the mucous membrane of the stomach, more especially of the cuticular coat, pigmentation, erosion, or ulceration. The positions in which these changes are most constantly met with are along the line of junction of the cuticular with the villous portion, and also at the lesser curvature. If an animal be destroyed during the early stages, discolored muddy yellow patches may be observed; if examined closely, one or all of them may present an eroded appearance. These changes are in most cases no doubt due to thickening and proliferation of the epithelium, which degenerates and breaks down, leaving the yellowish shallow ulcers. These, owing to the progressive degenerative changes, become deeper until, in many cases, perforation occurs. The ulcers may cover an extensive surface. I have seen some 6 or 7 cases in which from half to three-quarters of the cuticular coat was in an ulcerated state; and it was while making postmortems with another officer of the department that we came on two of the cases referred to, and in which no less than three-quarters of the cuticular surface was involved. The animals from which these stomachs were taken were destroyed, as they were suffering from surra. Neither was in bad condition, and both were taking food up to the very last moment. Though the cuticular coat is invariably involved, the lesions undoubtedly do in some cases extend to the villous portion. The anatomical differences, however, naturally, to some extent, alter the appearances of the ulcers, which are often seen with a smoother flat surface, and surrounded by a ring of swollen mucous membrane.

"I am of the opinion that in all cases of death from chronic surra, or in animals that have been destroyed after the disease has been in existence for some time, that ulceration of the stomach, more or less extensive, will be seen postmortem.

"The deep yellow pigmentation is not constant, but in nearly all cases there is a distinct yellowish tinge about the cuticular coat. The villous portion often is in parts, owing to degenerative changes, denuded of its epithelial lining. In some cases a large proportion of the cuticular coat may be pigmented. The color is a bright yellow, which shows up beautifully alongside of the whiteness of the normal epithelium. Parasites (*Spiroptera microstoma*) are constantly found, especially in the stomachs of mules, embedded in the gelatinous mucus of the villous coat, but, as you are well aware, have nothing to do with the disease. Bots are frequently met with, and this year I met with a case where the bots had attached themselves to the mucous membrane of the duodenum; there were quite 100. Spiroptera nests are sometimes seen in the stomach, I think more frequently in mules, but they are rare. Last month I was present at 41 postmortems, but did not observe a single nest. * * * "

Intestines.—In some cases there were petechiæ of the mucous lining of the intestines, similar to what was visible during life in the vagina and on the eyelids. The mucous membranes everywhere were more or less tinged yellow. (Griffith Evans, 1881, p. 7.)

In acute cases there is diffused congestion of the lining membrane of the bowels. In chronic cases there are small localized patches of congestion. (Steel, 1886a, pp. 170–171.)

Steel is quoted by Burke (1888a, p. 8) as authority for the statement that mucous congestions are continuous throughout the anterior two-thirds of the bowel, with presence of several worms. Burke (1897, p. 188) says that the alimentary mucous membrane is in an anemic condition with petechiæ and ulcerated spots [stomach?], the result of disintegration and atrophy.

In referring to the small intestine, Lingard (1893, pp. 81–82) states:

> "In a number of cases no pathological change of any kind is observable. On the other hand, it is by no means infrequent to find the mucous membrane between the duodenum and the cecum, more or less injected in patches, and ecchymoses dotted about either singly or in small groups. The solitary glands and Peyer's patches are never found enlarged or ulcerated, but the former present a pale color, whilst in the latter, the slightly pigmented condition of health. In those cases we have examined, the small number of entozoa present in the small intestines have been particularly noticeable, and especially has this been the case in Australians. Of the naturally acquired cases, 2 presented patches of congestion and 1 in those horses inoculated from the goat.
>
> "Ecchymoses were present in 2 naturally acquired, whilst no less than 9 inoculated, animals showed them."

George H. Evans (1899, p. 38) says that he has never observed ulceration of the small intestine, but he has noticed circumscribed local congestions. In a few cases, extensive mucous congestion was noticed. The intestines often contain a quantity of a very yellow fluid. There is nothing remarkable to note about the condition of the large intestine.

Liver.—According to Griffith Evans (1881, pp. 5–6), the structure of the liver was not diseased in any case, but in one instance the liver was studded throughout with calcareous degenerations of cestode larvæ. In two cases liver flukes were found with inspissated bile distending some of the bile ducts enormously.

Burke (1888a, p. 9; 1891, p. 271) refers to hepatitis, the early symptoms of which are shown by jaundice of the mucous membranes.

Lingard (1893, p. 82) states that the liver "is nearly always enlarged, especially so when death occurs during a paroxysm. In case No. 15 it weighed 19 pounds 17½ ounces. The anterior or convex surface, as a rule, presents circular patches, white or yellow in color, when the membranes have been yellow during life, and these are due to thickening of the capsule. The surfaces of both lobes in nearly all the cases observed have shown signs of old perihepatitis, and in a large majority of country-bred animals examined, small, round, or irregular masses of a hard, gritty consistency have been present on the surface of the organ, lying under the capsule and more or less invading the tissues; these are of parasitical origin.

"Perihepatitis was present in the organs of all the naturally acquired surra animals examined, and the hard concretions in Nos. 3, 10, 65, 70;

perihepatitis also was found in 16 inoculated horses and concretions in 13."

Nariman & Vaz (1893, p. 405) report that the liver is congested, enlarged, and, in some cases, calcareous. In one case the liver was simply a mass of stone from the aggregation of small calcareous particles, and weighed 49 pounds. The Veterinary Journal, London (1896, p. 177), refers to hepatic disturbances.

Hayes (1898, p. 481) refers to enlargement of the liver and spleen and petechiæ on various organs.

George H. Evans (1899, p. 38) says that the liver is usually healthy, but cases of congestion and softening may be met with. Miliary calcareous deposits are often seen, and in some cases the liver is much enlarged.

Pancreas.—The pancreas is normal. (Lingard, 1893, p. 82.)

Spleen.—Several authors refer to the enlargement of the spleen. Thus Lingard (1893, p. 82) says:

> "This organ is always enlarged to a greater or less degree, and, in some instances, has been found to assume abnormal proportions, especially in the case of an animal dying during a paroxysm, when the hematozoon has been swarming in the blood for some days. When, however, the animal succumbs and the organism has been absent for some time, it may be found to be little, if at all, enlarged. The capsule is generally dotted over thickly with irregular-shaped ecchymoses of a brick-red color, which are especially noticeable as they have a bluish-white colored or opalescent background.
>
> "The tissues as a rule, on sections, are firm to the touch and present a dark-red or purplish color.
>
> "This organ was found to be enlarged in 7 out of 9 naturally acquired cases, and in all petechiæ were present showing through the capsule. Of the inoculated cases, in 19 the spleen was enlarged, and in 18 out of 28 the petechiæ were marked."

Nariman & Vaz (1893, p. 405) say that the spleen is generally enlarged and hard, and George H. Evans (1899, p. 38) records that in advanced cases the spleen is generally enlarged. There is, as a rule, an excess of pulp, so that it pits upon pressure. The structure is at times disorganized.

According to Lingard (1895, p. 12), in the case of rats the weight of the spleen increases (from a minimum when the parasite is not present) in proportion to the number of hematozoa infecting the animal, and the maximum size of the spleen is reached toward the end of the rains. (See p. 128.)

URINARY SYSTEM.

Kidneys.—Griffith Evans (1881, p. 5) found the kidneys normal, except in one case, in which they were pale and sodden-like, but Burke (1888a, p. 3) refers to fatty degeneration of the kidney.

Steel (1886a, p. 171) refers to the kidneys as "congested or edematous." Lingard (1893, p. 84), in referring to the kidneys, says:

> "*The kidneys*, right—congested.
>
> "*The kidneys*, right—petechiæ. The organs generally present a pale appearance, but

not unfrequently one or both are the seat of numerous petechiæ, in some instances so small as to be only the size of a pin's head, but may be much more extensive. They are scattered over the external cortical surface of the organs, and on section are found to dip into and invade the tissues below. The stellate veins are frequently injected, and occasionally the surface of the organ is the seat of congested patches."

The Veterinary Journal, London (1896, p. 181), records that the kidneys are often pale, flabby, and colored with petechiæ, and according to George H. Evans (1899, p. 38) they are frequently affected; at times anemic and edematous, at others slightly or markedly congested. In some cases he has observed considerable blood extravasation on and in the under parts of these organs.

Bladder.—There is little to note about the bladder. In some cases a patch of extravasation may be observed at the fundus or small petechial spots scattered over the mucous membrane.

MUSCLES.

The muscles of the back, especially in long-continued cases, are found to have undergone considerable atrophy. In the majority of cases they are of a very dark-red color, as if the animal had succumbed to asphyxia. When the case has been complicated by jaundice, all the tissues present a more or less yellow tinge. (Lingard, 1893, p. 80.) (See also "Emaciation," p. 64.)

CONNECTIVE TISSUE AND BONES.

In the majority of cases there is found a varying amount of a gelatinous, light yellow, or greenish colored material, lying in the subcutaneous tissues. This may occasionally be present in very large quantities, especially in the neck, lying on either side of the trachea, in front of the sternum and along the most dependent part of the abdomen, also involving the sheath and the extremities. It is also frequently found between the muscles and running along the sheath of the nerves; and in cases complicated with pneumonia the individual lobules of the lung are divided off or insulated by this jelly-like material. (Lingard, 1893, p. 80.)

The bones and the white tissues of the body generally are tinged yellow in jaundiced cases. (Lingard, 1893, p. 80.)

(See also "Edema," p. 62; "Fatty changes," p. 79; "Jaundice," p. 78.)

NERVOUS SYSTEM.

Steel (1886a, p. 171) reports edema of the brain and spinal cord. Lingard (1893, p. 84) describes the pathological lesions of the nervous system as follows:

"*The cerebral membranes* in the majority of cases present a normal appearance, but in several cases increased injection has been noticed, and in one case the arachnoid presents signs of slight superficial extravasations.

"An access of fluid in the lateral ventricles has been frequently met with. This fluid is colorless or slightly opalescent, and in cases where the membranes have been yellow during life, the fluid may be tinged.

"The brain and cerebellum are pale, and the convolutions flattened when there is an excess of fluid in the lateral ventricles. The *iter a tertio,* etc., has been observed to be dilated, reminding one of the condition found postmortem in children who have succumbed to ventricular meningitis.

"*Spinal cord.*—In some cases there is an increase in the amount of fluid within the spinal canal, and in others a quantity of gelatinous material in the lower dorsal and lumbar region surrounding the cord, and this may in part account for the priapism in horses which occurs frequently in the course of the disease."

George H. Evans (1899, p. 38) states that he has never discovered extensive lesions in the nervous system. In a few instances the brain substance was undoubtedly soft and the plexus choroides was pale and bloodless. (See also p. 70, under "Action and paralysis.")

COMPLICATIONS OF SURRA.

Pneumonia.—When pneumonia was present, the consolidation was localized or circumscribed. In the majority of cases one lung only was attacked, but the lesions were not confined to any particular position, the apices, anterior inferior angles, bases, and center of the organs being the seat of the change; but in the latter position it was generally superficial, that is, lying directly under and for several inches below the pleura, which was also involved. It was observed in 3 out of 8 cases of the naturally contracted disease, and in 1 out of 2 cases when the disease was transmitted by gastric ingestion. But when transmitted by subcutaneous inoculation of antemortem and postmortem blood, with the former it was seen in 3 out of 19 cases, and with the latter in 6 out of 14 cases. (Lingard, 1893, p. 78.)

Emphysema.—A localized emphysema, usually complicating the apices and the edges of the lungs, was present in nearly every case in horses, but in guinea pigs it was found frequently pervading the entire organ. In several instances, distended lobules lying immediately beneath the pleuræ were found to project in the form of blebs as large as walnuts with very thin and almost transparent walls; while in one case the large bleb was filled with a clear but dark, amber-colored fluid, but not containing red-blood corpuscles.

A collapsed or atalectatic condition, more particularly of the apices, was not an infrequent complication. (Lingard, 1893, p. 78).

Nephritis.—According to Lingard (1899, p. 68), acute desquamative nephritis is a frequent complication of surra.

Pleurisy is an occasional complication. It was noticed in 3 cases; adhesions were present in 1 and with effusion in 2. (Lingard, 1893, p. 78.)

Sudden collapse has been mentioned by Steel as a not infrequent termination in surra cases in mules. In 2 cases Lingard (1893, p. 78) has observed it. In one case the animal fell dead without any premonitory symptoms or warnings of any kind.

Palpitations and vehement action of the heart occur to a greater or less extent toward the termination of every case. The impulse of the heart is so forcible as to move the body of the animal when each beat occurs. (Lingard, 1893, p. 78.)

Pericarditis has not been observed as a complication of surra. (Lingard, 1893, p. 78.)

Hemorrhages.—Lingard (1893, p. 78) observed epistaxis in 2 animals, but the hemorrhage on each occasion was only slight.

Miscarriage.—In small animals, such as rabbits and guinea pigs, pregnant females always miscarry within a short time after the appearance of the organism in the blood. If the female is near the full term of gestation when the organism makes its first appearance in the general circulation, the young may be born alive and thrive. (Lingard, 1893, p. 78.)

Edema of the extremities and undersurface of the abdomen.—In horses edema is of exceedingly common occurrence, and appears frequently as an early symptom. It first involves the fetlocks, more especially of the hind limbs, and gradually extends upward toward the hocks, the most noticeable features being the absence of heat and tenderness on pressure. In horses it is frequently accompanied by swelling and edema of the sheath and scrotum and at a later date spreads forward along the undersurface of the abdomen, finally invading the sternal region. In mares, after the extremities have become involved, small patches of semisolid edema are observed on one side or other of the chest or between the fore legs. As long as an animal is able to assume the recumbent position the exudation does not collect to any great extent, but as soon as the animal is condemned to the upright position for any length of time these accumulations increase, and may attain to considerable proportions. Arsenic when administered in full doses for some days appears to have a beneficial effect. The swelling and edema gradually become less and finally disappear completely. (Lingard, 1893, p. 79.)

Effusion in the joints.—This is sometimes met with, but is not of common occurrence. (Lingard, 1893, p. 79.)

CAUSE OF DEATH.

According to Steel (1886a, p. 169), some cases are acute and prove fatal after supervention of general dropsy, associated with local congestions. Probably the immediate cause of death in such cases is fever, for in his most acute case the animal, about an hour before death, gave the extraordinarily high temperature of 110° F. In chronic cases—that is, in about 96 per cent—death is brought about by gastric perforation, antemortem clot in the heart, or simply failure of the heart's action as a result of debility. The animals remain standing to the last, and suddenly fall dead or are recumbent or delirious for some days before the fatal result. Death is usually painless. (Griffith Evans, 1881, p. 3.)

CLINICAL DIAGNOSIS OF SURRA.

While certain symptoms, as already described (anemia, fever, petechiæ, ravenous appetite, extreme emaciation, high mortality, etc.), would naturally give rise to a suspicion of the presence of surra, microscopic examination of fresh blood to find the parasite is the most positive method of diagnosing the disease. In doubtful cases Lingard (1899, p. 60) injected the blood of suspects into guinea pigs and examined the blood of the latter daily. In the ordinary cases of surra, where no treatment has been adopted, the latent period, when guinea pigs are inoculated, is only about one week, but when the fluid for inoculation is taken from an animal that has been subjected to prolonged arsenical treatment the latent period is extended to about three weeks, and this time must elapse before the question can be decided.

> "The demonstration of the '*Trypanosoma Evansi*' in equines will distinguish surra from all other febrile diseases. As the periods of intermission in this disease vary in length from one to six days, so, in order positively to exclude the possibility of any cases presenting dubious symptoms being those of surra, it will be necessary carefully to examine microscopically the blood of the suspected animal daily for a period of 10 days. If the result of the blood examination should prove negative during the above-mentioned period, the case may then be safely declared not to be one of surra. It must be borne in mind, however, that a cursory examination of one cover-glass preparation of fresh blood on each occasion will often prove insufficient, for it happens in the course of a case that several days or occasionally a week may pass, during which period only one hematozoon may be discovered in two or even three cover-glass preparations. This most frequently occurs at the commencement or termination of a long paroxysm or in a case of chronic surra." (Lingard, 1893, p. 79.)

For a quick blood examination, it is recommended that a generous-sized blood drop be placed upon a cover slip. This slip is then placed, blood down, upon a slide, and gently pressed so that a blood ring forms around the cover glass. As this blood ring coagulates it seals the preparation. The parasites will be seen swimming with an eel-like motion among the corpuscles. They are about three to four times as long and one-eighth as thick as a white-blood corpuscle.

According to Griffith Evans (1881, p. 185), the parasites may be best observed in coagulated or defibrinated blood.

DIFFERENTIAL DIAGNOSIS.

According to Hayes (1898, p. 483), surra is often confounded with paralysis of the loins. Microscopic examination of the blood will give a positive diagnosis, while this and the chronic course of surra, together with the manner in which the internal temperature varies, distinguish surra from anthrax.

TREATMENT.

Nothing very encouraging can be said at this time on the subject of treatment. It is needless to lay stress upon the fact that a rapid destruction of the parasites is the point of greatest importance.

Salt and quinine are two of the most fatal substances for ordinary protozoa; osmic acid is also very fatal to them. We should be inclined to experiment along the line of hypodermic injections of quinine, salt, and arsenic in the hope of killing the hematozoa.

Griffith Evans (1881, pp. 184–185) has experimented with carbolic acid, but without success.

According to Ranking (1891, p. 403), the disease appears to be controlled by full doses of quinine, supplemented by general measures (chiefly milk, iron, and arsenic) to combat the anemia and weakness consequent on prolonged illness.

Nariman & Vaz (1893, p. 405) say that only two drugs are worthy of mention—inhalation of carbolic acid (1 oz.) in a closed room and the hypodermic injection of 2 grains of corrosive sublimate in a solution of common salt. When the former was used, the parasites disappeared from the blood in about 4 days, while after using the latter no parasites were detected after the second injection. In both cases, however, the animals died after lingering a few days longer. Iodine, iodide of potassium, quinine, and arsenic have failed to make any impression on the disease.

Burke (1897, p. 192) states that "though much has been said and written to the contrary, I hold, that provided prompt measures are adopted, and the disease is treated by quinine, arsenic, iron, and other tonics, by changing the water, and making some variation in the location of the animals, great benefit and even absolute removal of the disease may be secured."

Pease (1897, p. 551) states that quinine in large doses will not control the disease. "One ounce of quinine given daily for 7 days failed to exercise any influence over the surra organism, and had far more effect on patient." The attacks were invariably fatal.

Lingard has discussed treatment more than any other author. He selected the following drugs for experimental treatment:

> "*Mercuric chloride* has been employed subcutaneously, and also by direct injection into the circulation, with negative results.
>
> "*Iodine* and *iodide of potassium* by intertracheal injection, and also by subcutaneous inoculation, were followed by negative results.
>
> "*Iodoform*, by subcutaneous injection, and also by direct injection into the jugular, produced no good results.
>
> "*Oleum terebinthinæ*, by subcutaneous injection, and by injection into the jugular, was followed by negative results.
>
> "*Potasii bichromas* directly injected into the circulation, and by gastric ingestion, produced no marked effect upon the infusorian.
>
> "*Mixed cinchona alkaloids* and *arsenic* did not destroy the infusorian.
>
> "*Carbolic acid* and *iodine*, 76 drams of the former, and 34½ drams of the latter in 6 days, produced no apparent effect on the infusorian.
>
> "*Quinine*, in large doses, had no effect on the infusorian.
>
> "*Iodic hydrarg*, a very powerful antiseptic, had no effect.
>
> "*Santonin* had no effect.
>
> "*Potass* had no effect." (Lingard, 1894c, p. 174.)

He reports his best success with arsenic, and he gives the following general directions (1899, pp. 68–69) for its use:

NOTES FOR GUIDANCE IN THE TREATMENT OF SURRA IN EQUINES.

"Only animals in good or in fairly good condition are suitable to undergo treatment for surra. It will be found impracticable to attempt to cure ill-preserved animals, such as Tonga ponies, toward the end of a heavy and hard-worked season.

"2. It is of the utmost importance for the successful treatment of surra that the disease be recognized, and the animal subjected to the drug with the least possible delay.

"3. The weight of the animal should be ascertained frequently when practicable, so that the maximum dose of arsenic to be administered during the treatment may be regulated.

"4. Arsenic should be given in the form of liquor arsenicalis (Fowler's solution):

	Grains.
Arsenious acid (in powder)	87
Carbonate of potassium	87

"Add half a pint of distilled water to these in a flask and heat till dissolved; cool, and add compound tincture of lavender[a] 5 drams, distilled water sufficient to make 1 pint.

"5. In most cases of surra in equines a dose of 5 grains may be commenced with and given twice daily for 48 hours, the quantity being increased by half a grain after every four doses have been administered, until 7 grains are reached. The latter amount should be continued twice daily for 7 days in the case of an animal below 800 pounds in weight; but in Australians of 1,000 pounds in weight and upward the dose may be increased by the addition of half a grain up to 9 or even 10 grains twice daily for the same period. The dose should then be gradually reduced by half a grain or 1 grain, according to the condition of the patient, until a 4-grain dose has been reached. Again, if possible, after a peroid of 2 days, repeat the treatment, increasing and decreasing the dose of arsenic as above described. But the fact must never be lost sight of, that, if arsenio be administered to an animal for a prolonged period, symptoms of gastric irritation will supervene sooner or later. It has been found that by giving *kaunji*[b] to the animal, morning and evening, directly after the medicine, the above-mentioned symptoms have not made their appearance; consequently, it would be advisable to give *kaunji* to the animals from the commencement of the arsenical treatment.

"6. Daily microscopic observations of the blood should be made, and the number of organisms recorded on a chart for ready reference, together with the temperature, pulse, and respirations of the patient, which should be taken three times daily, namely, 8 a. m., 1 p. m., and 5 p. m.

"7. Most animals will take the drug in one or two pints of water from a bucket without any trouble. If this be found occasionally impracticable, the arsenic can be mixed with the corn and bran in the form of liquor arsenicalis; but in obstinate cases the medicine will have to be administered to the animal in the form of a bolus or in a draught.

"8. Acute desquamative nephritis is a common complication of surra, but it must not contraindicate the administration of arsenic, although the maximum doses can not be maintained; otherwise the animal will have a relapse and ultimately succumb to the disease.

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[a] The compound tincture of lavender may be omitted, but the animals under treatment take the medicine more readily when it is present.

[b] Linseed, rice—ā ā one-half pound. Add water a sufficiency. Boil for three-fourths hour, and give when cool.

"9. Animals suffering from surra, as a general rule, have voracious appetites. It has been found by practical experience that the following amounts of hay, corn, etc., are necessary for an Australian horse weighing 1,000 pounds and over; for on this the animal keeps in fair condition and during convalescence puts on flesh rapidly:

Hay, 15 to 20 pounds	Daily.
Lucerne (fresh), 10 pounds	
Barley,[*] 8 to 14 pounds	
or	
Gram, 6 to 10 pounds	
Bran, 1½ to 3 pounds	
Salt, 1½ ounces	

"10. When once the organism of surra has vanished for some days from the circulation of the animal under treatment, gentle exercise, commencing with 500 yards and gradually increasing to 1 mile, morning and evening, may be allowed. But if the temperature becomes elevated, all exercise must be stopped until the former again registers within normal limits.

"11. The exudation of semisolid material (edema) into the subcutaneous tissues, notably that of the lower extremities, sheath, and undersurface of the abdomen, generally becomes absorbed after a time under the influence of arsenic and exercise, but this may be accelerated by daily massage of the body and limbs.

"12. Surra horses, under treatment with arsenic for long periods, and which eventually die, at their autopsies frequently present some atrophy of the spleen. Consequently, subcutaneous injections of infusion of spleens have been made in order to ascertain whether the material injected would perform the function of the atrophied organ. Encouraging results have been obtained.

"13. Certain of the horse-surra cases under treatment somewhat suddenly developed symptoms of chronic arsenical poisoning. These, which include partial loss of power over the hind quarters, crossing of the hind limbs when walking, and general unsteadiness and nervous tremors, usually proved fatal within 48 hours, although the further administration of the drug was immediately discontinued on their recognition. In some of the later cases under our treatment these fatal symptoms have been successfully combated by the subcutaneous injection of infusions of spleen and testicle (sheep).

"14. The question with regard to the administration of arsenic to animals at the commencement of the rains as a preventive in districts where surra is epizootic is one worthy of trial. A dose of 5 grains of arsenic in the form of liquor arsenicalis (10 drams) given once a day in the drinking water to each animal could not fail to produce a beneficial effect, and could with safety be continued for a month at a time. The dose of arsenic should then be gradually reduced every 3 days by half a grain at a time until it is discontinued altogether. An interval of 7 days should then be allowed to elapse and again the same process persevered in, with intervals, until the termination of the rains or end of October."

[The following important circular regarding treatment has recently been issued in the Philippines:

CIRCULAR, No. 4.
HEADQUARTERS DIVISION OF THE PHILIPPINES,
Manila, P. I., January 11, 1902.

The board ordered to inquire into and investigate a disease of animals called "surra" have found that Fowler's solution of arsenic given intravenously destroys parasites in nearly every case, and animals so treated are doing well; but such treatment is as yet not conclusive as to cure. Such treatment may be tried at all points where animals are infected.

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[*] Boil half the daily quantity given to the animal morning and evening with half the amount of salt for 1½ hours, then mix with the bran and give when nearly cold.

The board also reports that common house flies taken on sick animals have been found full of parasites, and it is therefore ordered:

That all abrasions or wounds be kept covered to prevent possibility of infection from this source.

By command of Major-General Chaffee:

W. P. HALL,
Assistant Adjutant-General.

Undoubtedly the intravenous injection of arsenic will be found much more satisfactory than Lingard's method. Regarding the flies, a confusion has taken place. The fly referred to is the stable fly (*Stomoxys calcitrans*), not the common house fly (*Musca domestica*). The latter species does not bite.]

PREVENTION OF SURRA.

A number of authors have urged the earliest possible removal of animals to camps or to healthier grounds as soon as surra breaks out. Several authors propose that greater care be exercised in regard to the food, water, and care of the animals. In discussing preventive measures, Pease (1897, pp. 561–562) makes the following interesting remarks:

"The methods of prevention suggested by Burke have been suggested years ago for other diseases, and have been consequently carried out as far as is practicable, and, I regret to say, are found to prove ineffective in regard to surra. If the animals remain in a surra zone, as in many cases they must do, the most minute precautions appear to be valueless. In this regard the following case may be quoted. The Naini Tal horse dâk line, running from Kathgodám to Naini Tal, have for years suffered great losses from the disease. In order to eliminate as far as possible every imaginable means of introducing the disease, the following precautions were taken:

"1. All the water given to the horses to drink was thoroughly boiled.

"2. No animal was allowed to drink water or graze anywhere outside. Muzzles were worn whilst they were at work.

"3. The hay upon which they were fed was especially collected, under European supervision, from the high mountains, at an elevation of from 5,000 to 6,000 feet, and carefully stacked.

"4. No green fodder of any kind was allowed.

"5. All grain was carefully hand-picked and screened before use.

"6. Thorough cleanliness and disinfection of the stables were maintained, and the animals were well protected from the weather.

"The management of these animals was perfect, the superintendent being a European of great experience.

"Result of the precautions: Every single horse belonging to the company perished from surra in the season (1896).

"In the same way the disease annually occurs in the Bombay tramway stables, a perfectly managed concern.

"This points to the conclusion that there is some other method of introduction in these cases, possibly flies, which we can not guard against."

Lingard's (1899, pp. 69–70) suggestions as to prevention are summarized as follows:

PREVENTION AND LEGISLATION.

"As it is recognized that surra may be propagated in animals by means of drinking water, fodder, rat excrement mixed with corn, and the bite of certain kinds of flies, the following rules for guidance were drawn up some years ago (1894), and owners of dâk animals in certain surra localities were informed of the best means of trying to protect their animals from acquiring the contagium. The following are the most important:

"1. All water for drinking purposes should be boiled, when possible, from [during the months of] June to October, inclusive, before being given to the animals at stations in districts infected with surra.

"2. Hay should be made in cold weather (October to January), and stacked for the use of animals during the rains. The hay is to be obtained from uplands, or from land not subjected to inundation, or, better still, from land entirely beyond the affected area. Green food should, during the rainy season, be prohibited, unless it is brought from without the surra area.

"3. All gram and corn to be screened and cleaned before being given as food.

"4. The use of the bel (creeper) leaves as food to be discontinued during the months of June to September, inclusive."

"Suggestions applicable to animals working on certain dâk lines where surra appears annually in the rains:

"1. Dâk animals, when returning to their own stage, should not be allowed to graze or drink water along the road, especially during the months of May to October, inclusive.

"2. A light preventive muzzle might be introduced.

"3. All diseased animals should at once be isolated at a considerable distance from healthy ones, and subsequently destroyed if not subjected to treatment.

"4. All carcasses should be burned, together with the dung and stable litter, where wood is available for the purpose; otherwise, deep holes should be dug and the bodies buried at a depth of 6 feet.

"5. Stables should be erected on high ground, and not, as so frequently happens, in a hollow bordering on the bed of a river.

"It is well known that surra, when untreated, is an absolutely fatal malady, the disease taking an unusually rapid course in the case of overworked animals. When once the disease is diagnosed the animal is useless. Isolation and subsequent destruction, therefore, would entail no hardship to owners; and power to enable officers to enforce it, and the burning of all diseased carcasses, would be a great step toward the limitation of outbreaks.

"The question of the introduction of an act to limit the spread of surra, as in the case of glanders, is an important one. It would be useless, however, to bring one class of animals (tonga ponies) under an act unless the other (ekka ponies) were likewise included; for at present the former only are under compulsory registration, although the latter are quite as numerous.

"No government official can interfere with animals the subjects of surra; consequently, only advice can be given to the owners as to the best means of prevention against the spread of the disease."

Some of these suggestions appear to be rather difficult of execution and others appear to us unnecessary.

Considering the present status of the subject, we would suggest the following points for consideration in the Philippines:

(1) As horses and mules are more severely affected than donkeys and cattle, it would be well to depend upon the former as little as possible. Transportation trains using donkeys and cattle will be less liable to destruction than those using horses and mules.

(2) Avoid the introduction of Australian horses.

(3) Avoid light-colored animals as much as possible; the darker the animal the safer he appears to be from the attacks of flies.

(4) Isolate infected animals and protect them from flies, especially if they have wounds or sores of any kind. A coating of tar and linseed oil or any similar substance over a cut will protect it from flies.

(5) Protect stock from flies in wet weather by use of smudges and by smearing. Among the various substances used for this purpose may be mentioned the following:

PREVENTIVES.

"Smudges had thus far proved the best method of protecting animals in the field against buffalo gnats. Thoughtful planters are in the habit of collecting and storing during the year all kinds of material that will produce a dense and stifling smoke; such materials are old leather, cast-off clothing, dried dung, etc. As soon as large swarms of gnats appear, and the stock is threatened by them, fires are started in different parts of the plantation, and are kept burning as long as the danger lasts. Anything that will produce smoke is thrown upon the smoldering logs, and the most offensive is considered the most useful. If the time for plowing has arrived, smudges are located in the fields in such a manner that the smoke is drifted by the wind over the teams at work. Such smoke-producing fires are also kept burning in the cities, and they are found in front of every livery and street-car stable, as well as of such stores as employ draft horses or mules. If these animals have to be upon the roads, they may usually be somewhat protected by tin pails in which some smudge is kept, and which are suspended from their necks and from the wagons.

"Animals may also be protected with a layer of mud or a coat of sirup. It has been found that animals which have shed their rough winter coat of hair and have become smooth are not as much troubled as others still covered with long hairs. The gnats find it much more difficult to obtain a foothold upon a smooth skin, and the clipping of the hair in early spring is therefore advisable.

"Buffalo gnats have a great aversion to entering dark places, and stables thoroughly darkened are safe places for stock of all kinds in a gnat season. The odor of ammonia prevailing in such stables may also to some extent prevent the insects from entering. Planters with a small acreage, therefore, prefer to keep their horses and mules in the stable instead of working them in the field. For the same reason the owners of livery stables will not allow their animals to be taken outside the city limits if gnats are numerous enough to be dangerous.

"But the great majority of planters can not wait for the disappearance of the pest, and have to resort to other defensive means. Various external applications have been used to this effect. Decoctions of alder leaves, tobacco, pennyroyal, and other herbs have been tried with a view of preventing gnats from biting mules while at work; but all of them have proven ineffective. At a time when small swarms of turkey gnats were tormenting mules plowing in the field one side of the animal was moistened by Mr. Lugger with various insecticides, while the other side was not protected at all. By following the animal and watching the gnats it was soon observed that any offensive smelling substance would drive the gnats from the protected side to the unprotected one. Kerosene emulsion, pyrethrum powder suspended in water, diluted carbon bisulphide, and dissolved tobacco soap were all used in turn, and all seemed to produce the same effect. Several times the whole animal was carefully sponged with the one or the other of the above substances. For a time the gnats would not settle upon the animal; but in the course of two hours the beneficial effect of these insecticides was gone and the insects were no longer kept away.

"Experience shows that the best preventive is grease of various kinds. The following kinds are the most important: Cotton-seed oil alone, or mixed with tar, fish oil, gnat oil; a combination of stinking oils alone, or mixed with tar or kerosene oil, crude coal oil, kerosene oil, kerosene oil mixed with axle grease, and others. To be effective, the grease must be used at least twice during the day, because as soon as its offensive odor disappears it becomes inoperative. All such applications are of no advantage, however, on stock running at large. Gnat oil is very extensively used, but it is, like the rest of the remedies, very apt to remove the hair. In fact, all these different kinds of oil and grease are more or less injurious to the animals, because a continued coating with them weakens the system.

"The employees of the Hudson Bay Company protect themselves and their stock against the bites of the "black fly" by the use of oil of tar, and, as long experience has shown, it to be a simple and easily applied wash, we strongly recommend its use. A quantity of coal tar is placed in the bottom of a large shallow receptacle of some sort, and a small quantity of oil of tar, or oil of turpentine, or any similar material, is stirred in. The receptacle is then filled with water, which is left standing for several days until well impregnated with the odor. The animals to be protected are then washed with this water as often as seems to be necessary.

"As long as stock in the infested region is suffered to run at large, and is neither provided with shelter nor food during the winter months, it will suffer severely from the gnats. Animals well cared for can stand the attacks of the gnats far better, and do not perish as readily. Illtreated and unhealthy mules and those bruised and cut are the first to die, and the prevailing opinion of intelligent planters is to the effect that well-cared-for mules, if greased twice a day when working in the field, seldom die even when attacked." (Osborn, 1896, pp. 36-37.)

Stordy (1899, p. 14) gives a figure of a pony in pajamas as a protection against tsetse fly.

(6) So far as possible, avoid camping in moist and marshy localities.

(7) So far as possible, prevent flies from breeding. Since many flies—and among these the biting stable fly (see p. 109)—breed in manure, the fly pest may be greatly lessened by a proper handling of the dung. The outside manure pile should be abolished, and every stable should have attached to it a well-screened dark closet in which the droppings can be collected. A small shovelful of chloride of lime scattered over the freshly collected manure every morning, together with keeping the manure in the dark and screened, will do much toward preventing the increase of flies.

HORSEFLIES (FAMILY TABANIDÆ).

In order to place interested persons in immediate possession of the more important points in regard to horseflies of the family Tabanidæ, the following account of these insects is quoted from Osborn (1896, pp. 58-71):

"The members of this family are large, some of them being among the largest of the order Diptera, and the females are provided with powerful mouth parts by means of which they inflict very painful bites upon cattle, horses, and other animals. Man does not escape, and as they are able to penetrate even thin clothing worn in summer, they sometimes become a source of annoyance to workmen in fields.

"The bodies are never very hairy, the head is large and composed almost entirely of the eyes, which during life are of brilliant colors and varied reflections. The antennæ are prominent and the third joint is composed of from three to eight minute rings, a character which, with the large eyes, distinguishes them at once from nearly all other large flies. The strong piercing mouth parts of the female are composed of six lancet-like organs, while in the male there are but four and these are not adapted to piercing the skin of animals. The males, and also the females, if not finding other food, feed upon the nectar of blossoms or the juices of plants, exuding sap from trees, etc.

"The flight of these flies is very strong and rapid and is attended with a buzzing, tormenting noise. The males may often be seen with the wings vibrating so rapidly that they become invisible, resting motionless in one place and then darting rapidly and resting suddenly again, generally turning the head in some other direction each time they dart. St. Fargeau has ascertained that this maneuvering is performed in order to intercept and seize the females. The power of vision is apparently in proportion to the size of the eyes. Dr. Williston says 'that they can see for a long distance seems certain. On the uninhabited plains east of the Rocky Mountains the writer has frequently seen them coming from a long distance, attracted by the sight of the horse on which he rode.'

"Such of the larvæ as are known are either aquatic or live in moist earth and are carnivorous, hence they may in some degree compensate for the bloodthirsty habits of the adult females. But notwithstanding the abundance of the insects, very little has been done toward determining the early stages of the species. More than a century ago De Geer described the larva of the common European species, *Tabanus bovinus*, and up to 1864 this was the only larva of the kind known. In that year Mr. Walsh described a tabanid larva (Proc. Bost. Soc. Nat. Hist., Vol. IX, pp. 302–306), but without obtaining the adult form. In 1869 Professor Riley bred the same kind of larva to the adult form and described the various stages (Second Rep. Mo. State Entom., pp. 128–132), the insect proving to be *Tabanus atratus* Fab., which is described further on.

"Dr. Williston says: 'The spindle-shaped brown or black eggs are found in spherical or flat groups, stuck together, and attached to the leaves or stems of grass and other plants; those of the aquatic larvæ are fastened to rushes. The larvæ are carnivorous; many live in the earth, others in water. They are predaceous, often upon snails and injurious insects, thus in a measure repaying the agriculturist for the molestation they cause him. The young larvæ are known to penetrate beetles or other larvæ and remain within them till they have completely consumed them, and their enlarged bodies have filled out the skins. Thus the larvæ of *Hæmatopota* have been observed feeding upon *Helops* and those of *Tabanus* upon Noctuæ.' (Stand. Nat. Hist., Vol. II, p. 417.)

"Quite recently Mr. C. A. Hart has made a notable contribution to our knowledge of this subject,[a] which will be drawn from in discussing the early stages of particular species.

"Authors generally agree that the after effects of the bites of these insects are less injurious than those of mosquitoes or buffalo gnats. The painfulness of the bite and the terror inspired by their presence is, however, a source of great torment to animals that are almost helpless in protecting themselves against them. The puncture they make is large, and after the proboscis is withdrawn there is not unfrequently an exudation of blood from the wound. This would tend to remove any poisonous injection, but since there is rarely any swelling or inflammation produced by these bites, it would appear that no poison is conveyed upon their piercing organs. Dr. Packard speaks of cattle and horses being 'occasionally killed by their repeated harassing bites,' and while this seems to be rather strong language, and we will refer to it again in considering *Tabanus lineola*, there is no question that the effects are serious enough, so that it is desirable to protect animals as far as possible from their bites.

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[a] Article VI, Vol. IV, Bull. Ill. State Lab. Nat. Hist.

"With horses in use the common practice of protecting with nets is the most effective method we know of, but for animals in pasture it would be particularly desirable to find some substance which could be rubbed over the hair, and, retaining its properties for a reasonable length of time, have sufficient repelling power to keep the flies away.

"The larvæ are not open to successful attack, and even if they were, the fact that most of them are probably beneficial should deter us from using destructive measures against them.

"They are widely distributed, and species occur in all parts of the world, torturing alike the elephant and lion of the tropics and the peaceful reindeer of the arctic region. It is during the hottest summer months that they are the most abundant, and they frequent both our timbered and prairie regions.

"The species are quite numerous, over 1,300 being known, of which about 150 are credited to North America. Manifestly it would be impossible in a work like this to even mention more than a few species, and, since so little is known of the early stages, there is no necessity for treating each species in detail. We will therefore in considering the species simply refer to the more common ones, the habits of which have been observed, and more particularly those occurring in this country.

"Osten Sacken's admirable 'Prodrome of a Monograph of the Tabanidæ of the United States' in Memoirs of the Boston Society of Natural History (Vol. II, Part IV, Nos. 1 and 4) will enable anyone to make a thorough study of our native species.

THE BLACK GAD FLY, OR BREEZE FLY.

(*Tabanus atratus* Fab.)

"Probably this is the largest species in the family, and it is certainly one of the most conspicuous, being quite common and of such a decided black color as to attract attention either on the wing or when perched on the back of some poor animal that tries in vain to drive it off. Fabricius described it in 1794 (Ent. Syst., Vol. IV, p. 366). Walsh described its larva in 1864 (Proc. Bost. Soc. Nat. Hist., Vol. IX, pp. 302–306), and in Riley's Second Missouri Report (p. 128) its life history is given except the egg and early larval stages. Its bite is one of the most severe of the tribe, but fortunately the species does not occur in such great numbers as the greenhead fly. Its attacks seem more commonly directed against cattle than horses, and it is most noticeable in sunny pastures, though occasionally seen perched on trees or the side of some building. The eggs are doubtless deposited in the vicinity of water, in moist places, but the exact details of oviposition are unknown.

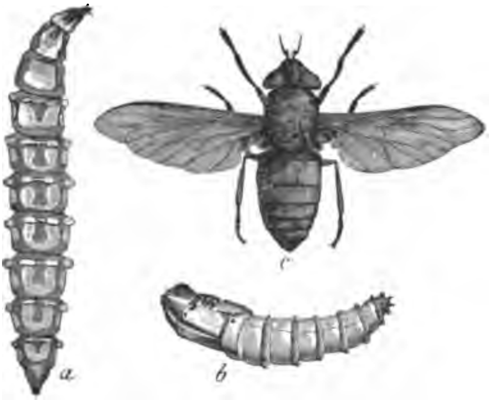


FIG. 97.—*Tabanus atratus*: *a*, larva; *b*, pupa; *c*, adult (after Riley).

"'The larva (fig. 97, *a*) is a large, twelve-jointed, cylindrical affair, tapering at each end, of a transparent, highly polished, glassy, yellowish, or greenish appearance, shaded with bluish green and furnished above and below, as in the figure, with large, roundish, sponge-like tubercles which are retracted or exserted at the will of the insect. Though the external integument is so transparent that the internal structure is readily visible, yet this integument is firm and the larva most vigorous and active, burrowing with great strength either backward or forward in the earth and between one's fingers when it is being held. Placed in water it will swim vigorously by suddenly curling round and lashing out its tail, but it is apparently not as much at home in this element as in the moist earth, for it is restless and remains near the surface with the tip of its tail elevated in the air. When the water is foul it moves about actively near the surface, but when it is fresh it remains more quietly at the bottom. The specimen which I succeeded in breeding was sent to me by Mr. Adolph Engelmann, of Shiloh, St. Clair County, Ill. It was found by Mr. William Cooper, of the same county, about 10 feet from a small but permanent body of water. Mr. Cooper at first took it to be a leech, and when he attempted to capture it it immediately commenced burrowing in the ground.'

"The larva reared by De Geer was terrestial. This larva is semiaquatic, for it is quite at home either in moist earth or water. My specimen was kept for over two weeks in a large earthen jar of moist earth well supplied with earthworms.

"It manifested no desire to come to the surface, but burrowed in every direction below. I found several pale, dead worms in this jar, though I can not say positively whether they had been killed and sucked by this larva. Mr. Walsh, in speaking of its haunts and its food, says:

"'I have, on many different occasions, found this larva among floating rejectamenta. On one occasion I found six or seven specimens in the interior of a floating log, so soft and rotten that it could be cut like cheese. Once I discovered a single specimen under a flat, submerged stone, in a little running brook. Finally, I once met with one alive, under a log, on a piece of dry land which had been submerged two or three weeks before, whence it appears that it can exist a long time out of water. I had on several previous occasions failed to breed this larva to maturity, and the only imago I have was obtained in 1861 from larvæ, which, suspecting them to be carnivorous from the very varied stations in which they had occurred, I had supplied with a number of fresh-water mollusks, but the habits of which, in consequence of having been away from home, I was unable to watch. On September 22, 1863, I found a nearly full-grown larva among floating rejectamenta, and between that date and December 23 he had devoured the mollusks of eleven univalves (genus *Planorbis*) from one-half to three-fourths of an inch in diameter; and on three separate occasions I have seen him work his way into the shell. In this operation his pseudopods were energetically employed, and I found, on cracking the shells after he had withdrawn, that a small portion of the tail end of the animal was left untouched—no doubt in consequence of his being unable to penetrate the small end of the whorl of the shell—and also the skin of the remaining part and the horny-tongued membrane.

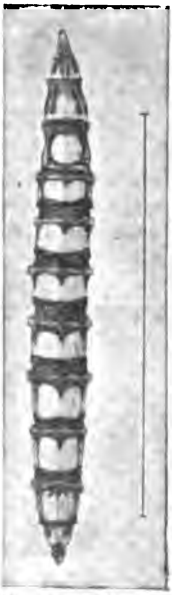


FIG. 98.—*Tabanus atratus*: larva (from Hart).

"'My larva transformed to pupa within the ground during the fore part of July; it remained in this state but a few days and the fly issued July 13, and soon made its presence known by its loud buzzing inside the jar. It was a perfect specimen, and the pupal integument was sufficiently firm and polished, that by carefully washing off the earth an excellent cabinet specimen was obtained, which retained almost the exact form and appearance of a living pupa. Before the escape of the fly, which was effected through a longitudinal fissure on the back of the head and thorax, reminding one of the mode of escape of our harvest flies (Cicadæ), this pupa by means of the horns with which it is furnished had pushed itself up to the surface of the earth.'

"The pupa (fig. 97, *b*) is nearly an inch and a quarter in length and a third of an inch in diameter. It is cylindrical, slightly curved, as in the figure, rounded at the head and tapering at the extreme hind portion. The abdominal segments are all but the first one provided with a ring of fine yellowish bristles, pointed backward. There is a stout thorn at the anal extremity, bearing six other thorns.

"The pupa state lasts but a few days and before the emergence of the fly it is pushed to the surface of the ground by means of the bristles and thorns of the abdomen, with bending movements of the body.

"It splits along the dorsal line and the fly emerges, leaving the pupa case in very perfect condition.

"The adult fly (fig. 97, *c*) is an inch or more in length, black throughout, the back of the abdomen covered with a bluish white bloom and the wings smoky black. They are common through the summer months and it is possible from the different times that full-grown larvæ have been observed that there is more than a single brood in a year. It seems probable, however, that the winter is spent in the larval stage and that the full-grown larvæ observed by Mr. Walsh in September were simply late specimens that had lived over the previous winter and would have pupated the same fall, producing the flies a few days later, and these have laid eggs to pass the succeeding winter. Hart says the larvæ were taken every month of the season except June, at which time they had mostly reached the pupa or imago stage.

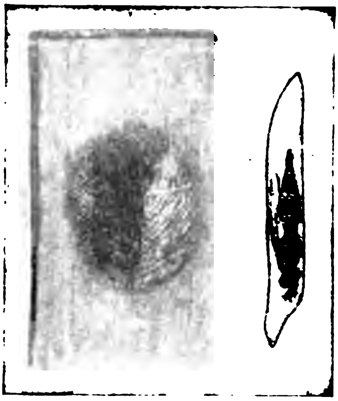


Fig. 99.—Egg mass *Tabanus atratus* and single egg containing parasite (from Hart).

"The habits of the adult have already been sufficiently stated, and as we have, unfortunately, no certain means of repelling them from cattle, so as to prevent the bites, which is the only thing we need fear from them, a discussion of remedies is unnecessary.

"It might be stated, however, that observations on the effect of tar and oil or other substances used to repel bot flies would be of value in arriving at some method of preventing their attacks.

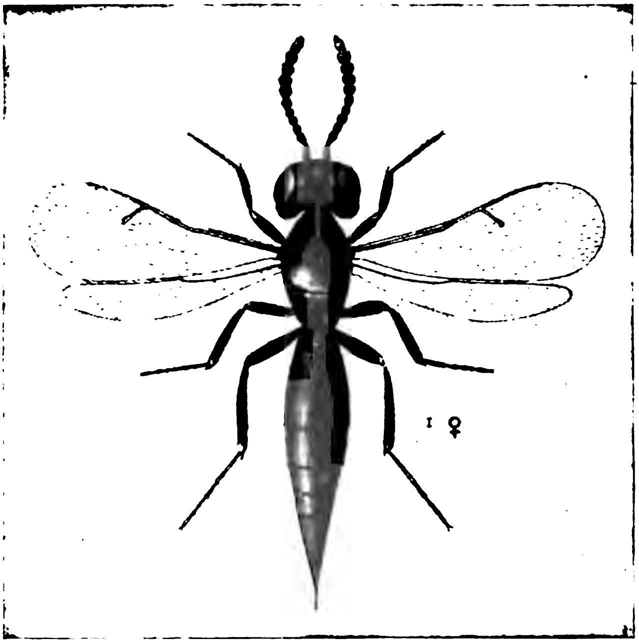


Fig. 100.—*Phanurus tabanivorus* Ashm. (from Hart).

"Hart records the rearing of parasites, *Phanurus tabanivorus* Ashm., from the egg masses of this species. Also the apparent parasitization of a larva.

GREENHEAD HORSEFLY.

(*Tabanus lineola* Fab.)

"This is generally regarded as the most common species in North America, and its occurrence in all parts of the country in large numbers fully supports such estimate.

"While it must have been a familiar pest to the early inhabitants of the country, its first scientific description was given by Fabricius. (Ent. Syst., Tom. IV, p. 369.)

"Packard (Guide to the Study of Insects, page 394), says:

"'This fly is our most common species, thousands of them appearing during the hottest part of the summer, when the sun is shining on our marshes and western prairies; horses and cattle are sometimes worried to death by their harassing bites. In cloudy weather they do not fly, and they perish on the cool, frosty nights of September.'

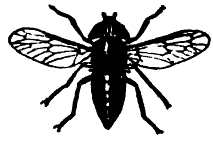


FIG. 101.—*Tabanus lineola* (from Packard's Guide).

"And also in Our Common Insects, page 74:

"'We were told during the last summer that a horse which stood fastened to a tree in a field near the marshes at Rowley, Mass., was bitten to death by these greenheads; and it is known that horses and cattle are occasionally killed by their repeated harassing bites.'

"This death of animals from bites must be very rare indeed, for in many years' residence in the Mississippi Valley, where the flies abound, the author has never known of such an incident, though the bites are certainly a great torment.

"The flies are brown, with a tinge of reddish, and the abdomen has a conspicuous whitish line along the middle. The eyes are a brilliant green, from which the name is derived.

"Hart has detailed the characters of the early stages as follows: 'The larva of this species closely resembles the young of *nigrescens*, and was not separated from it at first.' Examples of larvæ are said to have been collected in April and June, pupæ in May, and imagoes in May and June. 'The tabanid pupæ develop much more rapidly in hot weather than in cold, and to this fact is probably due the difference in time of emergence.'

"'Larva: Length, 20 mm.; diameter, 2.7 mm. Prothorax with lateral shining areas about as long as the dorsal area, striation about the same as that of the upper mesothoracic area; no noticeable central smooth spot; a small one on lower margin posteriorly; remaining lateral areas a little more finely and closely striate; dorsal and ventral areas of thorax nearly smooth on disk, with basal striæ; those on abdomen with moderately close striæ, more or less interrupted on disk; all areas more or less shining.

"'Surface whitish, dull pubescent markings very light brown but distinct, annuli narrow, crests of false feet also dull pubescent, their sides striate; lateral stripes of thorax distinct, slender, not dilated posteriorly, lateral edges of dorsal areas of thorax diverging; an opaque dark ring about the base of respiratory tube, and another encircling anal prominence, above it usually three light-brown spots.

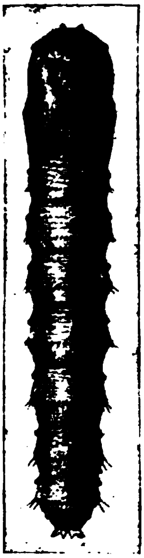


FIG. 102.—*Tabanus lineola:* pupa, dorsal view—enlarged (from Hart).

"'Main internal tracheæ rather thick and noticeable, subparallel, not strongly sinuate, at least back of the middle. Terminal stigmatal spine often protruded.

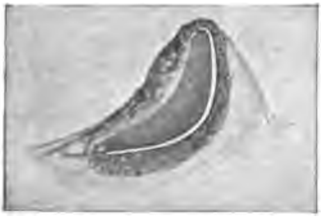
"'Pupa: Length, 19 mm.; diameter, 3 mm. Light ferruginous brown, shining, abdomen roughly wrinkled and subopaque. Palpal sheaths indistinct, not distant; tubercles not dark; ocellar tubercles indistinct or wanting; thoracic spiracular tubercles (fig. 103) slightly but nearly equally elevated, free margin rounded at tip, rima not vertical, evenly arcuate, slightly hooked in front.

"'Abdominal spiracular tubercles subtriangular, narrower behind, obliquely subconical, much shorter than basal diameter, bearing a small subcircular or short and strongly arcuate rima (fig. 104); on anterior slope a transverse groove, usually longer than the rima; fringes formed of unequal pale spines, only one or two long spines above on seventh segment; outer terminal teeth much longer than the others, directed laterally and upward, the tips of the four upper teeth about in line (fig. 105), fringe anterior to anal prominence showing a chitinous webbing between the bases of the spines, so that the separated tufts of the female look like a pair of broad, low teeth with several spiny points; lateral tufts low down, near ends of ventral fringe, formed of short spines.'—(Hart.)

"The species may be stated to have at least one natural enemy, for in the American Entomologist (Vol. II, p. 337) there is an account, by Mr. H. J. Dunlap, of their being eaten by the Nebraska bee killer (*Promachus bastardii* Macq.).

"This account is of considerable interest, and we quote it herewith:

"'*Champaign, Ill., August 6, 1870.*—I send you an insect by mail to-day in a glass bottle that has interested me for three or four years. I am hardly able to decide whether it is a friend or foe. My attention was first called to it by seeing several around my team during summer. Supposing them to be a new horsefly, I watched to see one bite, but was finally rewarded by seeing it pounce upon a greenhead (*Tabanus lineola* Fabr.). It settled upon my sleeve and soon had transferred the contents of Mr. Greenhead's body inside its own by sucking the juices out by means of its stout proboscis. I saw this operation repeated many times. The present summer I have seen them dozens of times, often five or six around my team, and have always noticed that in an hour or so after they appeared no more horseflies were to be found. I have also seen them 'sucking' house flies, lady bugs, chinch bugs, several moths, and have also seen them eat each other. The one sent you had just captured a honeybee, for which offense I made a martyr of him (or her) for the benefit of science.'



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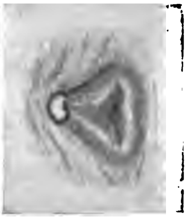

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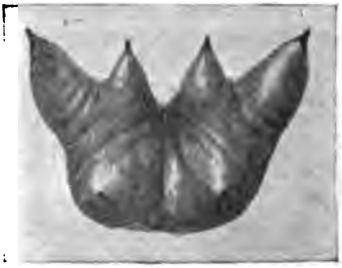

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FIG. 103.—*Tabanus lincola:* spiracular tubercle of pupa—enlarged (from Hart).
FIG. 104.—*Tabanus lincola:* abdominal spiracle of pupa (from Hart).
FIG. 105.—*Tabanus lincola:* end of last segment of pupa (from Hart).

THE GREENHEAD.

(*Tabanus costalis* Wied.)

"This is another common species very abundant in the prairie States, and was described many years ago. It is probably about as abundant and widely distributed as *lineola*, and causes a great amount of annoyance and suffering to domestic animals.

"The following from Hart presents our present knowledge of the life history of the species:

"'This seems to be normally a terrestrial larva. We have taken it two or three times in the earth of cornfields in Champaign County. The dates given are May 31 and June 4. Examples were placed in a breeding cage and an imago of *costalis* was secured from them.

"'The imago, known as the 'greenhead,' is very generally common, and is quite a pest in some bottom-land prairies. A few examples were noted along shore at Station D, August 20. The examples in our collection were taken on twenty-two occasions, all between July 15 and August 13, except three dates, July 8 and August 18 and 31, which would make it probable that it is single brooded. The localities are Carroll, Lake, Cook, and Ford counties at the north, and Fulton, McLean, and Champaign counties in central Illinois. The specimens were from a variety of situations, usually in low herbage, often taken visiting flowers.

"'Larva: Length, 20 mm.; diameter, 2.7 mm.; prothorax with lateral shining areas about as long as the dorsal, coarsely striate, a smooth spot near center of disk; dorsal and ventral areas of thorax smooth, a few striæ on those of metathorax, especially posteriorly; remaining areas moderately striate, lateral areas of abdomen a little more finely striate than the others; all more or less shining.

"'Dark annuli pale, narrow, longitudinal stripes scarcely present; false feet with dull pubescent crests, their sides rather finely striate; a narrow dark annulus at base of respiratory tubes, another round base of last segment, inclosing anal prominence and giving off a pair of lateral stripes, the lower one longer; no projecting spines seen.

"'Pupa (from defective cast skin of male): Length, 20 mm.; diameter, 3 mm.; light fuscous brown, shining; abdomen smoothly wrinkled; slightly opaque; prothoracic spiracular tubercles slightly but nearly equally elevated, free margin rounded at tip, rima not vertical, evenly arcuate, slightly hooked in front.

"'Abdominal spiracular tubercles small, subtriangular, narrower behind, obliquely subconical, much shorter than basal diameter, bearing a very small subcircular ring; fringes formed of unequal pale spines, the longer ones sparse on seventh segment above; outer terminal teeth twice as large as lower pair, directed laterally and slightly backward; upper pair smallest, directed upward; ventral fringe of last segment not noticeably webbed; lateral tufts rather high, not near ends of ventral fringe.

"'My material of this species is not in best condition for accurate comparisons.'

Tabanus annulatus Say.

"This species was described by Say in 1822 (Jour. Acad. Phil., Vol. III, p. 31; Comp. Writ., Vol. II, p. 53), and its territory stated as Missouri.

"It does not seem to have received special notice since.

"It is probably not abundant enough to cause serious annoyance to stock or is commonly confused with some more common species and has consequently received little attention.

"It is smaller than *Tabanus lineola*, the length of the body being a little more than two-fifths of an inch.

"It is of a leaden-gray color tinged with reddish; the abdomen blackish brown with gray margins to the segments, the wings without spots and slightly dusky. (From Say's description.)

Tabanus stygius Say.

"This species is almost as large as *Tabanus atratus* Fab., nine-tenths of an inch in length, and occurs in the Mississippi Valley. Say's description in 1822 (Jour. Acad. Nat. Sci. Phil., p. 33) locates it in Arkansas.

"It is violet black and with the thorax pale chestnut. The front of the head is yellowish, the thorax with five gray lines, the wings rusty with three brown spots. (From description of Say.)

"It is fairly common at Ames, Iowa, but has not been observed as especially annoying to stock. It has a wide range, however, and deserves to be studied with reference to its early stages.

"Hart gives the following facts concerning the species, with descriptions of early stages:

"'The present species was the most abundant tabanid larva in the vicinity of Havana last spring (1895). It first appeared in our collections September 14, when a number were noted swimming amidst vegetation near the margin at Station B. In the spring they were found at nearly all of the stations, but more particularly in connection with tipulid, muscid, and Eristalis larvæ, in matted accumulations of dead stems and leaves over mud. They were especially abundant March 30 in Flag Lake, where large plump larvæ appeared at every turn. It was a surprise to find a few of them upon the bottom in open, shallow water, far from shore, in the middle of Quiver Lake at Station A. Young larvæ have been common in connection with larvæ of

Bittacomorpha and *Limnophila* at Station I since March 17. At Stations B and G they have been common in moist drifts of fine rubbish washed up by waves. Pupæ were found in the breeding cages May 10 and 23. One emerged May 27 and another tried to emerge June 2, but died and was removed from its case.

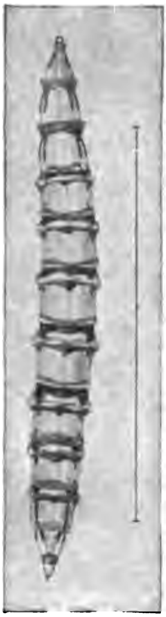

FIG. 106.—*Tabanus stygius:* larva (after Hart).

"'The larvæ resemble those of the *lineola* group in their striation and coloration, but differ in their short lateral prothoracic areas and larger size. They are like *atratus* in size, but may be readily separated from it by their coarser lateral striation, straw-yellow tint, slender lateral vittæ, and usually projecting terminal stigmatal spine.

"'Larva: Length, 45–55 mm.; diameter, 6–7 mm.; bright straw yellow, varying in some young larvæ to nearly clear white, marked with light fuscous brown microscopic pubescence, usually paler at each stage than *atratus*.

"'Lateral prothoracic striated areas not more than half as long as the dorsal, striation not finer than that of the middle and lower lateral areas of the mesothorax, striated portion shining; a small smooth spot adjoining the impressed line below; remaining upper thoracic areas a little less closely striated, but not strongly different from that of the prothorax; abdominal lateral areas a little more finely striate; dorsal and ventral areas with margin striated, disks nearly smooth in adult larvæ, last segment more strongly striate, especially beneath.

"'Dark annuli distinct, broad, including false feet, a distinct, transverse dorsal and ventral pale spot in front of the false feet; abdominal annuli often with a small triangular backward prolongation on median line above. Prothoracic lateral space occupied by a pale brownish fuscous quadrate spot in front of the striated space. Meso- and meta-thoracic lateral stripes usually distinct, but slender, scarcely dilated posteriorly, lateral edges of dorsal areas diverging; lateral stripes above the abdomen almost wanting, except on last two segments. In these stripes the punctures of the upper and lower rows are indicated by rounded pale dots, and those of the inner rows by elongate dots. Last segment with bases of respiratory tube and anal prominence encircled with dark rings, joined by a lateral connection, its dorsum with at most a short basal line or pair of dots on each side. Coarser pubescence of false feet tipped with pale brownish.

"'Main internal tracheæ thick and noticeable, especially in young larvæ, lustrous, subparallel, not strongly sinuate, nearly straight posteriorly; terminal stigmatal spine dark reddish brown, smooth, usually protruded (fig. 107, p. 106).

"'Pupa ♀: Length about 30 mm.; diameter about 6 mm.; light brownish fuscous, thorax paler, shining; abdomen roughly transversely wrinkled and subopaque. Palpal sheaths distinct, as far apart as are the setæ borne by the larger tubercles at the center of the anterior surface of the head; surface between them rounded, bearing a small wrinkled tubercle at middle; antennæ and tubercles darker than surrounding surface; ocellar tubercles distinct; prothoracic spiracular tubercles slightly but evenly elevated in a plane parallel with that of the surrounding surface; rima nearly straight in its outer half, inwardly curving strongly forward and ending in a conspicuous hook; free margin of tubercles rounded at tip.

"'First abdominal with two distinct setæ each side above the spiracles; abdominal spiracular tubercles rounded, broad behind, low, subhemispherical, rima long, following posterior border of tubercle, slightly curved at middle, more strongly curved forward at each end; on anterior surface a transverse groove extending across the tubercle, but not as long as the rima. Fringes of unequal spines, often tipped with blackish, all but two of the long spines wanting in a broad space above on seventh segment. Terminal teeth nearly equal, tipped with blackish, their points marking the angles of a hexagon, slightly wider than high. Ventral fringe of last segment not webbed together; lateral tufts high, on a level with upper lateral line.'

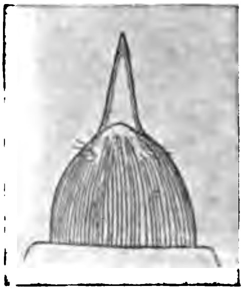

FIG. 107.—*Tabanus stygius;* last segment of larva, side view, showing projecting spine—enlarged (from Hart).

Tabanus molestus Say.

"In describing this species in 1822 (Jour. Acad. Phil., Vol. III, p. 31; Comp. Writ., Vol. II, p. 53) Thomas Say states:

> "'This is one of the species that are called prairie flies. It is numerous in the prairies of the State of Missouri and is very troublesome to the cattle. I have seen cattle in the forests which margin these prairies when attacked by these insects start suddenly and plunge into the thickets that the branches may divest them of their enemies. Travelers are much incommoded by them; many cover their horses with canvas, etc., to shield them from their attacks, or rest in some shaded or secluded situation during that part of the day when they are the most abundant.'

"No special mention is made of it in subsequent works, but we know it to be fairly common in the Mississippi Valley. Say's account probably covers territory outside of the present State of Missouri; and Wiedemann (vide O. S. Cat., p. 22) is authority for its occurrence in Kentucky.

"It is a rather large species, nearly four-fifths of an inch long; the thorax gray, with brown lines; the abdomen black-brown with a gray central stripe, which is widened on the middle segments and consists of triangular spots on the fourth, fifth, and sixth segments.

EUROPEAN GADFLY.

(*Tabanus bovinus* Linn.)

"From the statements of European writers this is apparently *the* gadfly of Europe, or at least the one which is particularly troublesome to cattle.

"According to Linnæus (Syst. Nat., Turton Transl., Vol. III, p. 67), it inhabits Europe, and is extremely troublesome to cattle.

"The eyes are greenish; back of abdomen with white triangular longitudinal spots.

"The early stages of this species were traced by De Geer (Mem. Ins.), who found the larva to be terrestrial and carnivorous. His observations on this species were the first giving information upon the early habits of the Tabanidæ.

THE BANDED BREEZE FLY.

(*Therioplectes cinctus* Fab.)

"The banded breeze fly, or orange-belted horsefly, is a species of somewhat larger size than the greenhead. It is rather less abundant than the black breeze fly, which it somewhat resembles, excepting the orange or reddish band on the abdomen. It is limited more to the Eastern States. It was described by Fabricius at the same time as *Tabanus atratus* (Ent. Syst., Vol. IV, p. 366).

Hæmatopota pluvialis Linn.

"According to Kollar this is one of the most troublesome species. He says:

> "'It is not much larger than the common horsefly, and is chiefly distinguished by its large green eyes, through each of which run four brown undulating bands.
>
> "'The body is gray with brownish cross stripes; the wings gray with brown spots. It frequents meadows and pastures and attacks horses and horned cattle in sultry weather before rain, nor does man escape. Although the wound it inflicts is sharp, it does not produce any lasting itching or burning.'

"This statement regarding the injury caused does not agree entirely with the statements of other authorities, for in Kirby and Spence's Entomology (p. 93) we find a quotation from MacLeay which reads as follows:

> "'I went down the other day to the country, and was fairly driven out of it by the *Hæmatopota pluvialis*, which attacked me with such fury that, although at last I did not venture beyond the door without a veil, my face and hands were swollen to that degree as to be scarcely yet recovered from the effects of their venom. I was obliged on my return to town to stay two days at home. Whenever this insect bites me it has this effect, and I have never been able to discover any remedy for the torture it puts me to.'

"Also, in Linnæus under the description of the species:

"'Like *T. cæcutiens*, this little insect fixes on the hands, face, and legs, exciting a painful inflammation in the part where it has drawn blood.'

The Ear Fly.

(*Chrysops vittatus* Wied.)

"This is a rather small species, yellow in color, with black stripes and a broad, smoky band across the middle of each wing. It was described in 1821 by Wiedemann, but without reference to its habits.

"It is said to be very troublesome in the wooded regions of the Mississippi Valley, directing its attacks particularly upon horses' ears, in consequence of which it is commonly called the 'ear fly.'

Chrysops univittatus Macq.

"This is a common species in the prairie region and is recorded from District of Columbia, Maryland, Connecticut, New Jersey, and Kentucky by Osten Sacken. It appears to be the most common species at Ames, Iowa.

Chrysops niger Macq.

"A similar species, black in color; also very common.

Chrysops quadrivittatus Say.

"Say described this species in 1822 as inhabiting the region near the Rocky Mountains. It is of a gray color, with four longitudinal brown lines on the thorax. The wings have a large brown spot on the front margin. It is nearly two-fifths of an inch in length.

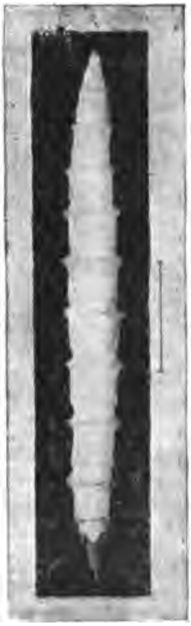

Fig. 108.—*Chrysops vittatus:* larva (after Hart).

Chrysops costatus Fab.

"Occurs in South America and the West Indies.

Chrysops fugax O. S.

"This species, easily recognized from the figure, is widely distributed. Osten Sacken recorded it from Maine, New Hampshire, Canada, Idaho, Montana, and Yukon River. It occurs at Ames, Iowa, and doubtless throughout the northern Mississippi Valley at least.

The Hippoboscid-like Tabanid.

(*Goniops hippoboscoides* Aldrich.)

"Under the above name Mr. J. M. Aldrich has described a very peculiar fly, that has the structure of the tabanids, but the general appearance of a hippoboscid, although it is not known but only surmised that it may have a parasitic or semiparasitic habit.

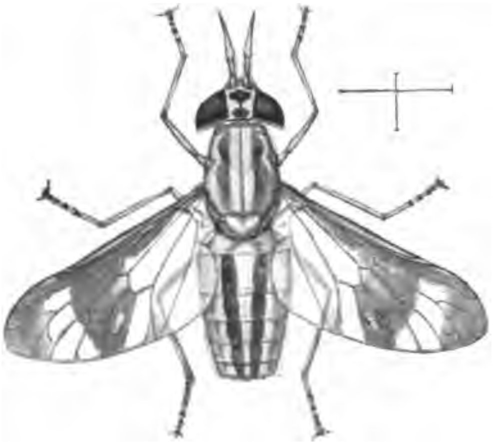

Fig. 109.—*Chrysops univittatus* (original, from drawing by Miss L. Sullivan).

"Since nothing is known as to the habits or the early stages of the species, and it would seem to be of very rare occurrence, it will suffice for the purpose of this paper simply to refer to the original description and figures (Psyche, Vol. VI, pp. 236, 237)."

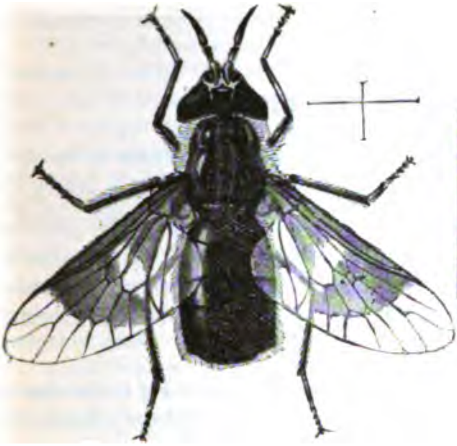

FIG. 111.—*Chrysops fugax* (original, from drawing by Miss L. Sullivan).

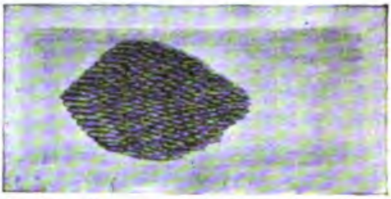

FIG. 110.—Egg mass of *Chrysops æstuans* (from Hart).

THE STABLE FLY (STOMOXYS CALCITRANS).

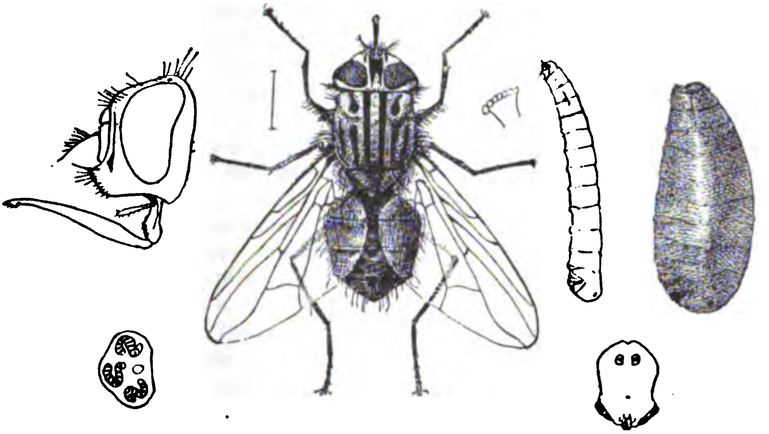

FIG. 112.—*Stomoxys calcitrans:* Adult, larva, puparium, and details—enlarged (original).

[Dr. Curry's observations mentioned on page 49 make it advisable to add a few words regarding the biting stable fly (*Stomoxys calcitrans*). This insect is somewhat similar to the common house fly (*Musca domestica*), for which it is frequently mistaken. Despite its name, it is not confined to stables, but frequents also groves and even houses, sometimes biting man and causing considerable annoyance. It is, in fact, this insect which has given rise to the popular idea that flies bite before a rain. It breeds in dung, so that a proper disposition of the manure, as suggested on page 98, will prevent its undue increase. This fly is very common, and has a wide geographical distribution.]

NAGANA, OR TSETSE-FLY DISEASE.

In connection with surra it will be of interest to the reader to be able to compare some of the recent results obtained from the study of nagana, or tsetse fly disease. To supply the necessary data we append here an account of the investigations recently published by Kanthack, Durham & Blandford (1898a, pp. 100–118). The report is reprinted in full, as it is not generally accessible to physicians and veterinarians here and in the Philippines.

"On nagana, or tsetse fly disease. (Report made to the Tsetse Fly Committee of the Royal Society of Observations and Experiments, carried out from November, 1896, to August, 1898.) By A. A. Kanthack, H. E. Durham, and W. F. H. Blandford.

"At the request of the Colonial Office, the Royal Society of London appointed a committee to cooperate with Surgeon-Major Bruce in his research upon nagana, or the tsetse fly disease. This committee intrusted us with the actual experimental work. The object was to study nagana systematically in ordinary laboratory animals, to investigate the life history of the hematozoon discovered by Bruce, and, if possible, to discover methods of prevention, cure, or immunization.

"The material for our observations was obtained in the first instance from the blood of a dog infected by the disease on the voyage from Africa, and brought to England in November, 1896, by Dr. Waghorn.

"The investigation was begun at once at the pathological laboratory of St. Bartholomew's Hospital, but in February, 1897, was transferred to the pathological laboratory of the University of Cambridge.

"*The Hematozoon* of nagana has already been described by Bruce, and is closely allied to the *Trypanosoma* of surra. We have had no opportunity of studying the latter disease, the relation of which to nagana is referred to later. The parasite discovered and described by Rouget[a] in a horse in Algeria is also similar. In English sewer rats (*Mus decumanus*) a *Trypanosoma* (*T. sanguinis* [*T. Lewisi*]) is occasionally found, but this is quite distinct from the hematozoon of nagana, both in its morphological appearance and in its pathogenic effects (*vide infra*).

I. Susceptibility.

"Cats, dogs, mice, rabbits, rats, both sewer rats (*Mus decumanus*) and white and piebald rats (*Mus rattus*), are highly susceptible, and in these animals the disease has proved fatal in every case of infection which has been allowed to run to a close.

"A single *hedgehog* inoculated was readily infected and died in 17 days, so that this animal probably possesses a high susceptibility.

"A single *donkey* was inoculated and was killed 12 weeks later, being then in a weak condition and near dying.

"Two *horses* have been inoculated, one a strong and well-fed cart horse (Russian), which survived 7 weeks, the other a rather old animal (see under zebra hybrids), which survived only 8 days.

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[a] Annales de l'Institut Pasteur, 1896, p. 716.

"A *bosch-bok* has also been inoculated; it died 7 months afterwards without showing any lesions. All the inoculations made from it proved negative.

"Two hybrids of zebra and horse (♂ zebra and ♀ horse, and ♂ horse and ♀ zebra) and one hybrid of zebra and ass (ass ♂ and ♀ zebra) have also been inoculated. These were kindly put at the disposal of the Royal Society by Prof. Cossar Ewart, of Edinburg, in order to see whether such hybrids are refractory to nagana.

"The two former were infected by plunging a needle wetted with nagana blood beneath the skin; the latter received a dose of 1 c. c. of the same blood. All of them died in about 8 weeks. During the course of the disease they showed irregular rises of temperature, sometimes up to 41.6° C. Variations in the number of hematozoa were ascertained in the case of the horse hybrids; on some occasions they were abundant (66,000 per c. m.). Whenever the donkey hybrid was examined at the earlier stage of the illness, the hematozoa were found to be either scanty or absent. A horse which was inoculated as a control died in 8 days, with very abundant hematozoa in its blood; this animal must have been peculiarly susceptible to nagana, as no other cause for death could be found at postmortem examination. There is no reason for supposing that the hybrids exhibited any more refractoriness than other horses or asses.

"Koch[a] reports on attempts which he made to infect two Masai donkeys, and two crosses from Muscat and Masai donkeys. None of these showed any symptoms of the disease up to 3½ months, nor were hematozoa discovered in their blood at any time, although repeated examinations were made. Consequently there is no proof that these animals were really infected. In our experience scratch inoculations sometimes, though rarely, fail; on the other hand, inoculations by puncture with a needle or by actual injection do not fail; Koch's animals were inoculated by the scratch method. It should be added that all his control infections were successful. He did not find that ordinary mules showed any immunity.

"With regard to *guinea pigs*, at first we thought that they were refractory under normal conditions, and that it was possible to infect them only after their resistance had been reduced by bleeding or other interferences.

"We found, however, that guinea pigs are susceptible to nagana under ordinary conditions, but that, as a rule, the disease in them is more protracted than in rabbits, rats, mice, cats or dogs, and even horses; so that they are distinctly more resistant than these animals. In no instance, however, has recovery ensued after hematozoa have once appeared in the blood.

"According to unpublished observations by Bruce upon the tsetse fly disease in South Africa, it appears that native *goats* and *sheep* are to some extent refractory, the disease, as a rule, running a chronic course (five months).

"A *monkey* (*Macacus rhesus*) was also tried. It died in about 2 weeks in an advanced condition of pulmonary tuberculosis, but the presence of abundant hematozoa had been determined in the blood during life up to the time of death.

"A *weasel* was injected. It showed hematozoa in its blood, and died a few days later, but death almost certainly was hastened by the effects of captivity.

"Pigeons are the only *birds* which have yet been tried. The pigeons after inoculation did not show signs of the disease, nor was their blood infective. It may be mentioned that Bruce tried South African *hens* without success. Further experiments with birds are in hand.

"*Young animals*, if susceptible (kittens and puppies), as a rule, have died earlier than adults, and while suckling they are still more highly predisposed; young guinea pigs, however, are comparable to older ones in their resistance.

"The *fetus in utero* of infected rabbits, guinea pigs, or rats is not infected, although the mother's blood may contain a large number of hematozoa. The latter are to be found in the placenta, but not in the fetal blood. Similar observations have also been made by Lewis,[a] Lingard,[b] and Rouget[c] in their investigations on allied hematozoa.

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[a] Reiseberichte [1898a], pp. 69 and 88.

II. Duration of disease in the different animals.

"As will be seen from the figures given below, the lethal period varies somewhat in each species of susceptible animal. The duration of the disease appears to depend principally upon the individual susceptibility rather than on the mode of inoculation or the quantity of infective material introduced. Thus, of 4 rabbits inoculated in the same manner with the same material, 3 died on the twelfth, twenty-first, and twenty-fourth days, respectively, while the fourth was killed on the forty-first day; many similar instances could be cited. Nor does a larger quantity necessarily determine a more rapid death; thus, a rabbit which has received the whole blood of another rabbit containing numerous hematozoa may survive longer than the minimal lethal period for rabbits. We have not been able to define the conditions which determine these variations in susceptibility. Rouget has noted similar variations in the lethal period.

"The ratio of the minimal to the maximal lethal periods is about 1 to 5 or 1 to 6 in rabbits and rats, and 1 to 9 in guinea pigs. The number of other animals inoculated has not been sufficiently great to determine a satisfactory ratio.

"In our experiments dogs survived an infection 14 to 26 days, cats 22 to 26 days, rats 6 to 28 days, mice 8 to 25 days, rabbits 13 to 58 days, and guinea pigs 20 to 183 days; the average duration being for dogs 18 days, for cats 24 days, for rats 12 days, for mice 13 days, for rabbits 30 days, and for guinea pigs 50 days.

"Since the commencement of these experiments a large number of animals have been dealt with, and thus an extensive series of cross inoculations has been carried out; but we have found that the duration of the disease is not dependent on the kind of animal from which the hematozoa are derived. No constant modification is therefore effected by passages, either in the direction of attenuation or of increased virulence. This statement is completely borne out by Bruce's observations on wild animals, as well as African sheep and goats, for he found that the hematozoa of these animals were as infective as those obtained from highly susceptible animals, such as dogs.

III. Mode of inoculation.

"Inoculations have been made with the blood of an infected animal subcutaneously, intravenously, or intraperitoneally, or by applying a minute and often minimal quantity of infected blood to a superficial scratch. Rabbits have also been inoculated in the anterior chamber of the eye; and rats directly into a lymphatic gland.

"Blood taken from diseased animals, although showing no hematozoa when examined microscopically, has frequently been proved to be fully infective, so that it appears that a single hematozoon or at any rate a very small number of them, successfully introduced, are capable of producing the disease. At present no method of graduating the dose appears possible, since a minute quantity is as effective as much larger quantities, though the lethal period may be somewhat prolonged. It is also possible that unrecognized forms are present in these cases, though it should be added that in some instances where no hematozoa are found in simple films we were able to detect them by means of centrifugalizing the blood.

"Successful inoculations have also been made with lymphatic gland, spleen, bone marrow, aqueous humor, serous fluid, edema transudation, and testicular juice.

"The incubation period and the duration of the disease, as already pointed out, are not entirely dependent upon the number of hematozoa in the material injected.

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[a] Physiol. and Pathol. Researches (1888), p. 630.

[b] Summary of Further Report on Surra, 1895 (p. 12).

[c] Annales de l'Institut Pasteur, 1896, p. 716.

or the source of the infective material. Thus, the hematozoa of lymphatic glands, etc., are as infective as those of the blood. The duration of the disease is not materially affected by the mode of inoculation adopted, and is about the same whether the infection was brought about by subcutaneous, intravenous, or intraperitoneal injection, or by a superficial scratch.

"Material taken from the bodies of animals twenty-four hours or sometimes less after death is hardly ever infective, even when several cubic centimeters are injected, so that we have no evidence of a resisting or sporing form which survives in the tissues or blood of the dead animal and is inoculable into other mammals. It must be added that putrefactive changes often set in with great rapidity in the bodies of animals dead of nagana.

"Blood drawn from the living infected animal and kept *in vitro* in an aseptic condition retains its infective power *at most* for 3 or 4 days, but this period is generally less. Complete drying also renders blood noninfective.

"Blood heated to 50° for 30 minutes invariably becomes noninfective, even in large doses (such as 4 c. c.), while, when heated to 46° C. for half an hour, it proved infective in one out of two cases, although apparently the hematozoa had become nonmotile—at least no motile forms were detected under the microscope. But even in this case the lethal period was not prolonged.

"Infection by feeding has been attempted by means of a number of experiments. Sometimes it was successful—in most cases unsuccessful; so that it has seemed to us that the possibility of infection by the mouth depends on accidental lesions about the mouth, nose, ears (in rats), or alimentary tract.

"Of a number of rats fed on organs of nagana animals only a few acquired the disease, and these invariably showed superficial lesions of the snout and ears due to lice. When fed upon infective material, they bury their snouts in it as well as scratch their ears with their blood-stained forepaws. Furthermore, in the rats which acquired the disease through feeding, the cervical glands were always enlarged most, which proves that the hematozoal infection must have taken place in the head, for, as we shall show, the primary infection travels by the lymphatics.

"A cat fed repeatedly on soft tissues of the bodies of infected dogs and cats, and subsequently on the bodies of dead rats, died at a time corresponding by lethal period to an infection at the first meal on rats. We regard it as probable that some splinter of bone caused a superficial lesion through which the hematozoa were enabled to enter.

"One rabbit, fed carefully by means of a pipette with large quantities of infected blood, never showed the slightest sign of the disease. Rouget (1896) also failed to infect animals by the mouth.

"Two rabbits, into whose conjunctival sacs several drops of blood containing very abundant hematozoa, and a third rabbit whose eye was brought into contact with one of these, did not become infected. We presume that Rouget's positive results by this method were due to some accidental lesion.

"A dog suffering from the disease did not infect her puppies during the last 14 days of her life, nor did these puppies infect their foster mother (she cat) after they had been inoculated.

"Nor have we observed transmission of the disease through the mother's milk in guinea pigs. Rouget alludes to a doubtful instance of infection by coitus in rabbits by means of the spermatic fluid. We have not detected hematozoa in spermatic fluid obtained from the vesiculæ seminales, and believe that in Rouget's single positive case there may have been direct infection from the penis, which suffers considerably in rabbits and may become excoriated, so that it easily bleeds.

"We therefore do not believe that it is possible to infect an animal by feeding in the absence of superficial lesions, and in this respect we differ from Bruce, who seems to imply that the hematozoa can pass through the unbroken surface of the alimentary tract.

IV. Symptoms and course of the disease.

"These vary somewhat according to the nature of the animal, but there are certain striking symptoms which commonly occur in different groups of animals. These may therefore be regarded as the most characteristic.

"1. *Muscular wasting* and *loss of power* are evident in all but the small animals. In rats, mice, and guinea pigs they are but little marked or absent altogether. In the horse, dog, cat, and rabbit the wasting is very conspicuous. In the cat, dog, rabbit, and hedgehog there is marked loss of weight, amounting to 20 to 30 per cent.

"2. *Fever.*—In most animals which have been examined there is a smart rise of temperature about the time of appearance of hematozoa in the blood. (Horse, 41.5° C.; dog, 40° C.; rabbit, 41° C.; guinea pig, not constant.)

"Paroxysms of fever are common in the *horse*, as has already been shown by Bruce. The temperature may rise to a considerable height (41.6° C.). The same is true of the zebra-horse hybrids. In a horse upon which daily observations were made, quick and sudden rises of temperature immediately followed an increase of the hematozoa in the blood. At the time of death there was marked pyrexia.

"In the single *donkey* which we examined the temperature was generally raised throughout the course of the disease.

"In *dogs* there is also fever, the temperature becoming subnormal on approach of death.

"In *rabbits* pyrexia is common, and generally the temperature is elevated throughout the disease, but it may fall suddenly to normal. The temperature curve is always irregular, and no relation between the temperature curve and the hematozoal curve could be established.

"In *cats* also the fever is well marked, the temperature falling quickly toward the end.

"It is difficult to speak with certainty of the temperature in such small animals as *rats* and *mice*.

"In *guinea pigs*, representing less susceptible animals, fever as a rule is not a special feature. The temperature is as irregular as it is in the normal animal, but the animal shows paroxysmal rises from time to time, sometimes above 41°. These may be accompanied by an accession of hematozoa into the circulation, but this is not a constant feature.

"3. *Edema* is common in certain animals, such as the horse, rabbit, cat, and dog, and is most marked about the head, legs, belly, or genitals. In smaller animals, such as rats and mice, it is not usual, and in guinea pigs it has not been observed. In dense tissues, as the rabbit's ear, there may be a local edema at the site of inoculation.

"Rabbits exhibit a special tendency to edema of the external genital organs. There is often great and progressive swelling of the prepuce or labia, as the case may be. The swollen parts often excoriate and become sore and covered by crusts, so that the animal is in a sorry condition.

"4. *Changes in the eyes and nose.*—In cats, dogs, rats, and rabbits turbidity of the aqueous humor, fibrinous plaques in the anterior chamber, and corneal opacities are occasionally observed. In rabbits a mucopurulent conjunctivitis is common, and this may be followed by an opacity of the cornea and a turbidity of the aqueous humor, which under such conditions shows hematozoa microscopically as well as leucocytes. Hematozoa have also been discovered in the conjunctival discharge in the earlier stages of the disease. Vascular corneal ulcers sometimes occur in dogs, and the conjunctivitis of cats, dogs, rats, and rabbits is frequently associated with edema of the eyelids and face. In rabbits the eyelids and nose frequently become almost entirely closed up by the drying of the secretion. In the latter case they breathe with great difficulty, keeping their mouths open. This condition has been described by Rouget (1896).

"5. *Anemia.*—Some degree of anemia is always present, but it does not seem to be so extreme as to be the sole attributable cause of death, and points rather to a disturbance in the hematopoietic or the hematolytic mechanisms.

"The number of red-blood corpuscles steadily diminishes and nucleated red corpuscles (normoblasts) often appear, especially in rats. According to observations on rabbits, the diminution of hemoglobin is roughly proportional to that of the blood corpuscles.

"Leucocytosis is not a constant feature and when present is apparently due to the febrile temperature. An excessive leucocytosis, such as occurs in leukemia, was never observed; 15,000 to 34,000 leucocytes being the highest numbers recorded per cubic millimeter.

"Blood drawn from an animal seriously ill, when clotted, generally exhibits a marked buffy coat; the serum is often turbid and may undergo secondary clotting.

"Instead of forming rouleaux, the red corpuscles tend to clump into masses and to lose their outlines, especially when the anemia is pronounced (rabbit, ass, and horse).

"The serum of such blood, when mixed with normal blood of the same species of animal, causes the red corpuscles to clump together also.

"The urine of infected dogs spectroscopically examined often shows an intense urobilin band.

"Wounds do not heal well, and tend to break down and become septic, even though the operation has been performed with strict aseptic and antiseptic precautions. The hematozoa may be abundant in the discharge from the wounds. Many animals, especially dogs, are apt to become infected with pyococci and other bacteria in the later stages of the disease, even when the inoculated material has been proved to be free from bacteria. We conclude that a spontaneous terminal bacterial infection may occur when the marasmus has reached a certain degree. This may accelerate death and is probably fairly often the case in the naturally acquired disease. But we have often proved by cultures that bacteria are absent in uncomplicated cases of experimental inoculation.

"7. A voracious appetite has not been observed in the infected laboratory animals; some animals refuse their food and the stomach is not seldom empty after death.

"8. Rats and guinea pigs often exhibit convulsive or eclamptic seizures shortly before death, but otherwise guinea pigs, rats, and mice show no symptoms of disease, except dullness in the later stages.

"9. Transmission from one animal to another, without direct inoculation, has never been observed. Nor have we come across instances of infection by coitus or through suckling, although we have dealt with large numbers of animals.

V. *Morbid anatomy.*

"In *rats* and *mice* exactly the same conditions may be observed. The most striking changes are:

"(1) Enlargement of the lymphatic glands, the glands corresponding to the seat of inoculation being always largest. This observation is important, because from the relative size of the glands it is possible to determine the seat of infection. To this allusion has already been made, when the effects of feeding were discussed. The glands are generally red, congested, juicy, and edematous; in a few instances hemorrhagic extravasation has been observed. In some cases all lymphatic glands in the body are enlarged, in others a particular series only. If a rat be inoculated in the right thigh, the glands in the left axilla and left groin suffer last.

"(2) The spleen is much enlarged, with but few exceptions, and it is generally firm, friable, and dark colored.

"(3) The liver generally shows some enlargement and may be fatty.

"(4) Wasting of the muscles and atrophy of the fat is, as a rule, not well marked.

"(5) Subpleural ecchymoses are sometimes present in the lungs, accompanied by a small amount of pleural fluid.

"In *rabbits* the general enlargement of lymphatic glands is less noticeable. The spleen is generally enlarged. Petechial ecchymoses are rare. Fatty degeneration of the liver is always present, and muscular wasting is often extreme. Enlargement of testes has been observed.

"In *dogs* muscular wasting is well marked, the animal being often reduced to a skeleton, but the fatty tissues are generally not much affected, except at the base of the heart, where the fat may undergo edematous degeneration. The general enlargement of the lymphatic gland is well marked, and, as in the rat, the glands are edematous and congested, yellowish, or even show hemorrhagic extravasations.

"The spleen is also greatly enlarged, granular, firm, and friable.

"Pericardial effusion is common; pleural effusion may be present.

"Subpericardial petechiæ and hemorrhages occur frequently, subperitoneal occasionally, and sometimes also submucous in the intestines and stomach.

"In *cats* wasting is pronounced, the glands are greatly enlarged, the spleen is also enlarged, the liver is slightly enlarged. Hemorrhages beneath the pleura and pericardium have been noticed.

"In *guinea pigs*, which clinically often show no changes or symptoms at all, the morbid changes after death are not very well marked. The spleen is generally moderately enlarged, and occasionally even considerably; it is often very soft and rather pale. The lymphatic glands are distinctly, but as a rule only slightly, enlarged, those corresponding to the seat of inoculation being always the most affected.

"Hemorrhages have been observed in the lungs and in the stomach; serous effusions and edema have not been noted.

"In all these animals the bone marrow is sometimes dark red in color, at other times natural, or paler than it should be. In the shafts of the long bones the fat disappears and becomes replaced by 'red' marrow.

"In many cases an iron reaction has been obtained with the liver, spleen, and kidney (ammonium sulphide; and $K_4FeCy_6 + HCl$).

VI. Distribution of hematozoa.

A. Blood.

"After a latent period of some days, hematozoa are invariably found in the blood at some time or other during the course of the illness.

"1. *Rats.*—When the animal is inoculated with small quantities of infective blood, the latent period averages 3 to 4 days. When, however, a large number of hematozoa is inoculated into the peritoneal cavity, the parasites may be found in the blood even after a few hours.

"When the hematozoa have once appeared in the blood, they are generally found therein to the end, gradually increasing in number till the blood literally teems with them. During the early stages of the disease, however, variations are frequently noted, inasmuch as an increase on one day may be followed by a marked decrease on the next. In a few cases they have even temporarily disappeared from the circulation for a day or two, but this is distinctly rare in rats and mice, although common in other animals.

"At the later stages the hematozoa may amount to 2,000,000 to 3,000,000 per c. m.

"2. *Mice.*—What has been said of rats applies also to mice.

"3. *Rabbits.*—In these animals, after inoculations with minute quantities of blood, the parasites first appear in the blood in about 8 days, about the same time as the pyrexial attack. They remain in the general circulation for a day or two in small numbers; this is followed by a disappearance and reappearance for a variable number of days at irregular intervals. In the animals which have been systematically examined the hematozoa do not appear abundantly until toward the close of the disease; the largest number which has been estimated near the time of death has been 60,000 per c. m. (compare rats and mice), but even at that time they may be scanty and difficult to find. They are also to be found in the fluid of the local edema and discharge from wounds, conjunctiva, or genitals. Although hematozoa may be so scanty that they can not be discovered by the microscope (sometimes even after centrifugalizing), the animals show marked clinical symptoms. Their blood has often been proved to be infective.

"4. *Dogs.*—Early in the disease, from 4-6 days, the hematozoa may be absent from the blood, but observations on their presence during life in the lymphatic glands have not been made. Toward the end they become very numerous (100,000 to 300,000 per c. m.). Variations in the number of hematozoa are common, but as a rule hematozoa are numerous throughout the disease.

"5. *Cats.*—The latent period is about 5 days; then the hematozoa appear in the blood, and, with daily variations, quickly increase in number. The variations are sometimes remarkable; thus on one day the hematozoa may be extremely numerous, while on the next day they will have become scanty.

"6. *Horse.*—Systematic observations on this animal, as well as on the donkey, have been made by Bruce. In our first horse the latent period was 7 days. The first appearance of hematozoa in the blood was followed by a sharp rise of the temperature. After the hematozoa once showed themselves they were generally scanty and often absent (the centrifuge was not used), but an appearance of the hematozoa in the blood was generally followed immediately by a paroxysm of fever. A few days before death, however, the number increased greatly, falling again to zero 2 days before death and being low at the time of death.

"7. *Guinea pigs.*—After a subcutaneous inoculation, a few hematozoa will generally be found in the blood about the fifth to seventh day. They may then again disappear and reappear from time to time, to disappear again after a few days. This alternation may go on for weeks. Then suddenly the hematozoa become numerous and gradually increase, sometimes with irregular variations, till the blood is almost crowded, 200,000 to 500,000 per c. m. being present. The guinea pigs die, generally without showing any symptoms, except perhaps convulsive attacks a day or two before death.

"In some cases no hematozoa have been found in the blood for over 6 weeks, although it has been examined daily. They then appeared in small numbers, and after remaining scarce for a week or so, suddenly and rapidly increased as the disease approached its fatal termination. It is, however, more common to find a few hematozoa about a week after inoculation, this being followed by a more or less prolonged period of absence.

"In cases where the disease runs a less protracted course, the hematozoa become numerous about 4 weeks after the inoculation, when they are often present in large numbers; but, as in the case of other animals, the number of hematozoa may be very variable, being almost enormous one day and very considerably less, or even very small, the next. In a case where the guinea pig had been bled before inoculation the disease ran a rather short course; hematozoa appeared 9 days after the infection, rapidly rising in number to over 128,000 per c. m., the animal dying after 22 days. In a few cases where the lymphatic gland corresponding to the seat of inoculation was examined, hematozoa were found in the gland, while they were absent in the blood.

B. Lymphatic glands.

"In the rat the superficial lymphatic glands may be readily examined by piercing them with fine capillaries or sharp needles; they may also be excised and examined more thoroughly. Although a considerable number of observations have been made by these means, and also after killing the animals at various periods after inoculation, we wish to speak somewhat guardedly, since the appearances are not quite constant. Moreover, we are at present unable to be certain that unrecognized developmental forms have not been overlooked.

"By the study of the right inguinal glands after subcutaneous inoculation in the right thigh, we find that the hematozoa are present from 1 to 3 days before they are discoverable in the blood (taken from the ear or right leg). Again, they may be very abundant in the gland when they are still scanty in the blood. Moreover, the number in the blood may increase, while that in the gland decreases. In these earlier stages the hematozoa may be extremely numerous, forming tangles and clusters in the lymph gland, while only a few scattered ones are to be found in the blood. The first appearance of hematozoa in the gland of the other side is apparently associated with their appearance in the blood.

"The observations, fewer in number, which have been made upon guinea pigs, also point to a multiplication in or about the nearest chain of lymphatic glands in the first instance.

"We have not yet determined whether these hematozoa pass directly into the blood through the local blood vessels or whether they are distributed by means of lymphatic paths into the main circulation.

"The animals may appear comparatively well while large numbers of parasites are present in their blood and glands; this is especially the case with rats and guinea pigs. On the other hand they may be seriously ill while the hematozoa are scanty in their blood; this obtains usually in rabbits, in which animals, as already stated, the glands do not become so much enlarged, and it is possible that the main effect of the parasites is borne by other organs. For instance, at times the bone marrow has shown the presence of hematozoa, although search in other organs and in the blood proved negative.

"After death in the various animals hematozoa are to be found in most cases in the bone marrow and spleen. The adult hematozoa may be common in these situations when but few are present in the blood; but this is not constant, for the reverse may be the case. Multiplication of the parasites certainly takes place in the lymphatic glands (rat) as well as in the infected area of connective tissue. It may also occur in the above-mentioned organs as well, and perhaps, too, in the blood, but of this we have no certain evidence.

"The hematozoa are also found in the fluids of the serous cavities, at any rate when they are present also in the blood.

"They have not been found in the intestinal contents, nor have they been seen in the urine, except in one case in which hematuria and submucous petechie of the bladder were present (rat).

"It is evident from these observations that, in order to investigate the development of the hematozoa in the rat, etc., special attention must be paid to the seat of inoculation and the nearest lymphatic glands.

"Dead and nonmotile forms may frequently be found in the circulation and in the lymphatic glands when the disease is advanced. These are less defined and are ghost-like, being somewhat swollen in appearance; they are also generally in an extended condition.

VII. Toxic power of the blood.

"The fact that animals may appear to be well for days while hematozoa are abundant in their blood suggests that the hematozoa do not secrete much, if any, specific toxin, and indeed so far no direct evidence has been obtained of a potent poison manufactured by the hematozoa, either by secretion or by chemical changes induced in the blood.

"Fresh serum after filtration through Berkefeld filters, and blood or serum which had been kept for days in a sterile condition till the hematozoa had died, have had no specific toxic effects, even when large quantities have been injected into dogs, rats, or rabbits. Blood in which the hematozoa have been killed by exposure to 50° C. has had no more effect. The extracts of organs obtained from diseased animals have also shown no poisonous properties.

"The whole available blood of highly diseased rabbits has been injected immediately after removal into healthy rabbits without producing immediate symptoms of acute intoxication.

"The bile of diseased animals does not appear to be more toxic than that of healthy animals.

"A cat, into the peritoneal cavity of which a collodion sac full of fresh infected blood had been inserted, showed no signs of illness. It was fully susceptible on subsequent inoculation.

"Dogs, when injected with large quantities of filtered serum from an infected dog, showed no symptoms of a profound toxemia.

"Our experiments do not point to the presence of any intense specific toxin or poison in the blood.

VIII. Immunization and cure.

"The endeavors to produce immunity, or to cure the disease after its establishment, are shortly summed up as follows:

"1. Animals which have been repeatedly injected with blood or serum of nagana animals, such blood or serum having been previously freed from living hematozoa, either by filtration, heat, or by allowing it to stand for a week or longer, have not shown the slightest degree of an acquired immunity. Rats, rabbits, and dogs have been tested in this manner, but none of these animals have shown any diminution in susceptibility.

"2. Animals repeatedly injected with extracts of the organs of diseased animals have acquired no resistance.

"3. The blood of almost full-term fetuses, prematurely born of highly diseased rabbits, has been tried, but without the slightest success in prevention or cure.

"4. The guinea pig being a comparatively resistant animal, its serum has been used, but it also has no immunizing action.

"5. Repeated inoculations of bile of diseased animals have been without preventive or curative effects, although *in vitro* bile, which is always free from hematozoa, rapidly destroys the hematozoa. Infective blood mixed with sufficient bile becomes noninfective, but confers no immunity.

"6. Previous inoculations with the hematozoon of the ordinary rat (*T. sanguinis* [*T. Lewisi*]) have also been valueless.

"7. Sewer rats and white rats which have been repeatedly, but unsuccessfully, inoculated with the ordinary rat hematozoon (*T. sanguinis* [*T. Lewisi*]), and have been proved to be refractory to further inoculations with this hematozoon, have all contracted nagana when subsequently inoculated, and have died in the same time as control animals treated with an equal dose of infective blood.

"8. The young born of infected mothers (dog, guinea pigs) are no more resistant than those born of normal animals.

"9. As already stated, by constant transmission through different species, the nagana hematozoon has shown no definite loss or gain in the intensity of virulence.

"10. Of immunizing sera the diphtheria antitoxin and antistreptococcus serum have been used, but, as we expected, without the slightest effect; they neither protect nor cure.

"11. *Dieting.*—Rats have been fed, on the one hand, exclusively with meat, and, on the other, with green vegetables; in neither case has any increased resistance or prolongation of life resulted from this alteration in diet.

"12. Excision of the lymphatic glands immediately after inoculation or after they have begun to show enlargement has been of no avail.

"13. Feeding with hematozoa also conveys no immunity.

IX. Allied hematozoa.

[See also pp. 33-43.]

1. Trypanosoma sanguinis [*T. Lewisi*].

[See also p. 33.]

"As already mentioned, in sewer rats (*Mus decumanus*) a *Trypanosoma* may be found in a certain percentage of individuals. This hematozoon is distinct from that of nagana morphologically, and also as regards its pathogenic effects. Thus (1) the *T. sanguinis* [*T. Lewisi*] has not been communicated to the dog, cat, rabbit, or mouse, even when large quantities of blood were used for inoculation. (2) In some guinea pigs it has been found in very small numbers in the blood for two or three consecutive days, usually from about the fifth day after injection; but there has been no persistence. (3) In white rats many unsuccessful inoculations have been made with the *T. sanguinis* [*T. Lewisi*], even with considerable doses, and it appears that the minimal infective dose is larger than with the nagana *Trypanosoma*. (4) White rats may lose the hematazoon after they have been proved to have been successfully inoculated with the *T. sanguinis* [*T. Lewisi*]. (5) Some of those which had had, and then lost, the parasite proved refractory on reinoculation. Black and white (piebald) rats have nèver been successfully inoculated in our experience. (6) No rat has been successfully inoculated with the *T. sanguinis* [*T. Lewisi*], except at the first attempt. (7) We have not been able to recognize any illness after successful inoculations with *T. sanguinis* [*T. Lewisi*]. Any pathogenic effect it may have must be slight. Infected rats remained alive for months; we have not observed any instance where death was to be ascribed to the hematozoon.

"R. Koch[a] examined rats in Dar-es-salam, and also recognized differences between the hematozoon of the local rats and the *Trypanosoma* of the tsetse disease. Whether the *Trypanosoma* occurring in the African rats examined by him is identical with that occurring in our English rats we can not decide, although from the brief description given by Koch they certainly closely resemble each other. Nor did Koch succeed in infecting animals other than rats with the African rat *Trypanosoma*. He therefore showed that the parasites which occur in the blood of rats (in Dar-es-salam) do not stand in any relation whatever to the tsetse disease of horses and cattle. In this connection the observations of Bruce are of great value, because they prove that in big game the tsetse parasite certainly does occur without apparently causing acute, fatal, or even obvious disease; in the same manner, this parasite may sojourn in the body of the guinea pig for weeks and months without interfering with the health and development of the animal for a long time. Furthermore, Bruce (in an unpublished report) has made similar observations on the South African goat and sheep; he shows that in these animals the disease runs an extremely protracted course, and lasts for months.

2. Trypanosoma of surra (*Trypanosoma Evansi*).

[See also p. 35.]

"Koch announces that the disease known as surra in India and the tsetse disease of Africa are produced by the same parasite. His reasons for this assumption are apparently not based on extensive personal comparative observation.[b] Lingard, working in areas naturally infected with surra, has not clearly distinguished between the Trypanosoma of surra and that occurring in rats in India. His account of surra as it occurs in rabbits and guinea pigs and rats is suggestive of this disease being closely similar to nagana, but it is impossible for us to pretend to give any final decision in the matter. To illustrate the confusion in which Lingard has placed the matter, it may be pointed out that he writes that cows, horses, monkeys, and field rats are susceptible to inoculation with the ordinary Indian rat hematozoon, but that rabbits, guinea pigs, dogs, cats, and donkeys are insusceptible, but he adds that the latter animals are susceptible after this rat hematozoon has been passed through the horse. He also asserts that surra can be produced in horses by feeding on the excrement of rats. These observations are calculated to create a certain amount of suspicion, particularly when it is remembered that Vandyke Carter failed to infect horses with the Indian rat *Trypanosoma.*[a] For the present, therefore, the question must be left open till an opportunity arises of studying the various parasites at the same time side by side, both in their morphology and pathogeny.

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[a] Reiseberichte, 1898a, pp. 70 and 71.

[b] Reiseberichte [1898a], p. 66.

3. *Trypanosoma of Rouget.*[b]

[See also p. 37.]

"Rouget describes *Trypanosoma* disease in Algeria, which apparently is identical with the disease described by Bruce. Judging from the drawings and descriptions, his parasite agrees with that of nagana. He will not commit himself as to the identity of his parasite with that of surra. White rats and mice, rabbits, and dogs exhibited a considerable susceptibility, while guinea pigs, he says, were refractory (possibly because he did not recognize the chronicity of the disease). Sewer rats were not always susceptible, while some showed a relative immunity. It seems, however, that he did not reinoculate them so as to test their immunity again. His description of the symptoms and anatomical appearances in mice, rats, rabbits, and dogs agrees almost exactly with our own observations. He claims to have succeeded in immunizing a number of mice by injecting them with the serum of an infected rabbit previous to inoculating the *Trypanosoma;* six mice survived altogether,[c] while others lived for 17 to 23 days. As a curative agent this serum was useless. Guinea pigs' serum also had no preventive action.

X. *Biology of the nagana hematozoon.*

"So far our knowledge of the nagana parasite, as that of other Trypanosomas, is very incomplete. Rouget[d] has failed to find forms corresponding to those described by Danilevsky in birds and by Shalashnikov in rats, and Lewis and others have been equally unsuccessful, while it is difficult to follow Lingard in his description of young forms. We have not succeeded in tracing a life history, and we are still in search of developmental forms, a task which at present occupies our special attention.

"1. Most commonly in blood, etc., drawn from infected animals the forms described by Bruce are found. They are generally in active movement and can sometimes be observed in locomotion with their flagellated end forwards, as Lewis described in the case of other hematozoa; in many cases they do not change their position by free swimming, but tend to fix themselves by one or other end to the coverslip or to corpuscles or cells in the specimen. They then exhibit more or less rapid oscillations, and may change their position by apparently drawing or pushing themselves in one direction or the other. Meanwhile the vibratile membrane waves rapidly and the protoplasmic body alters in shape, becoming thicker and shorter or thinner and longer. In the case of the English rat hematozoon free swimming is the rule. Changes in the shape of the body like those of the nagana organism are not observed.

"2. The nagana parasites vary considerably both in size and form; they may be long and pointed or blunt-ended and somewhat stouter. Some individuals are short and thick with a short flagellum, their protoplasm being crowded with rounded granules. Still larger forms possessing more than one vibratile membrane are sometimes, though rarely, met with.

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[a] Scientific Memoirs of Med. Officers of the Army of India, 1887, Part III, p. 56.

[b] Annales de l'Institut Pasteur, 1896, vol. 10, p. 716.

[c] It does not appear whether they were again tested.

[d] Loc. cit. [1896], pp. 722 and 723.

"3. Especially in specimens taken from lymphatic glands, but also in specimens obtained from the blood, etc., there is a clear vacuole at the thick end. This does not become stained with staining reagents. It varies much in size in the different individuals, but we have watched in vain for evidence that it is of a contractile nature.

"4. By means of hemalum or hematoxylin a nuclear body can be demonstrated in the middle of the parasite. It is usually oval, but may be more saddle-shaped. The protoplasm also contains a number of granules which stain with basophil reaction (methylene-blue, thionin, etc.); these are somewhat variable in number, being fewer in specimens in which the protoplasm is more refractive, e. g., from lymphatic gland. These granules are distributed irregularly throughout the body of the parasite; they do not occur in the membrane or the flagellum. The chromatin spot situated close to the nonflagellated end in the *T. sanguinis* [*T. Lewisi*] is not defined in the nagana *Trypanosoma*. The *T. sanguinis* [*T. Lewisi*] also does not stain at all readily even by basic aniline dyes (dahlia, fuchsin, etc.) while that of tsetse disease is more readily colored by these reagents.

"5. Examples joined by the poles opposite the flagellum are common at times, but although they suggest perhaps conjugation, we have no evidence that this process does really occur. After prolonged observation no further changes have been noticed in these jointed individuals.

"In freshly drawn blood, or in the lymph of lymphatic glands, or in pleural and peritoneal fluid, when the hematozoa are common, tangles made up of numerous hematozoa have been observed; this has been already described by Lewis. The hematozoa often converge with their nonflagellated ends toward one common point. In lymphatic glands, before the hematozoa are found in the blood, such tangles may be present in great numbers.

"6. Forms consisting apparently of two individuals joined side by side by their bodies, the flagella being free, have been observed on rare occasions; from prolonged observation in the living state we have no reason to suppose that these are undergoing longitudinal fission. Especially in kept blood, etc., many of the hematozoa may present a rhomboid outline while still motile.

"In drawn blood or serous fluids the hematozoa eventually become motionless; this may occur rapidly, for instance in 20 minutes, but generally some motile specimens can be found after 2 to 3 days—sometimes, indeed, after as long as 5 or 6. When they are abundant, the tangles above noted are formed. Then the bodies of the organisms become rounded, the nuclear bodies becoming more distinct and readily stainable (hematoxylin or basic aniline dyes). At the same time the vibratile membrane or fin and the flagellum separate, forming a rather rigid filament. Eventually (generally after 3 to 4 days) masses of spherules alone remain; these apparently correspond to the nuclear bodies. In numerous experiments these structures have uniformly proved to be noninfective, and it must therefore be inferred that if they are not simply degeneration products, they require other conditions for their further development than those that are found in warm-blooded animals. All individuals, however, do not pass through these changes; some, or even all, may simply become nonmotile, stiff, and pale, at the same time retaining their form. In numerous attempts at cultivation in normal blood, similar phenomena are observed without any evidence of multiplication. Within a corpse the blood and organs become noninfective in about 24 hours, the changes in the hematozoa being similar to those just described.

"Exposure for several hours in an atmosphere of hydrogen or CO_2 has no appreciable effect on the motility of hematozoa in blood-free serous fluids. The hematozoa are also fully active in hosts killed by ether, chloroform, or coal gas.

"7. Oval forms, smaller than the ordinary hematozoa, with (or without) a short flagellum, and often with a 'beak' at the opposite pole, have been observed in the organs, but rarely in circulating blood.

"8. Small rounded or ovoid bodies, about 1 to 2 μ in diameter, hyaline, sometimes with a refringent chromatin spot or bipolar spots, or irregular (? amoeba-like) bodies, also sometimes with a chromatin spot and of the same size or rather larger, have been observed, especially in the lymphatic glands and bone marrow, or spleen. It is possible that these are early stages in the development of the hematozoon. No forms have been seen at any time within the red-blood corpuscles.

"9. Neither sporocystic nor larger distinctly amoeboid forms have been observed.

"As our observations on the development of the parasites are still in an incomplete condition, this short statement must suffice, and a more detailed description must be left for a future occasion, when we submit a full report upon our work."

MAL DE CADERAS.

In South America there exists an equine disease which is more or less closely related to surra and dourine. Lecler (1899, p. 6) was inclined to consider it of bacterial origin, but Elmassian (1901a, p. 604) and Voges (1901a, p. 598) consider it due to a *Trypanosoma*, for which Voges proposed the name *Trypanosoma equinum*. The parasites are most numerous in the circulation during the rise of temperature. Upon its reaching 40° to 41° C., they gradually disappear, but reappear upon the next increase in temperature. In length the trypanosomes are three to four times the diameter of a red-blood corpuscle.

This malady extends from the Argentine provinces St. Fe and Corrientes on the south to Chaco, Missiones, Paraguay, Matto Grosso, and Bolivia on the north. It is a "wet weather" disease, which almost completely disappears in dry seasons. Horses, mules, asses, swine, and water hogs are said to be affected, and horses are never known to recover. It is chronic in course, lasting 2 to 5 months in horses and 6 to 12 months in asses and mules. The clinical symptoms are described as an intermittent fever, the temperature usually rising slowly, then suddenly falling to normal; rapid progressive emaciation; dark-red urine occasionally containing albumen and blood; the red-blood corpuscles decrease in number, and the microscopic changes of pernicious anemia appear; the lymphocytes and especially the eosinophiles increase considerably in number; the most marked symptom is a symmetrical or an asymmetrical paresis of the hind legs; defecation and urination (coinciding with paralysis of the sphincter ani and of the bladder) difficult; dyspnea; appetite and extreme thirst preserved to the last; gradual extension of the paralysis to other parts of the body; edema frequent. On postmortem there are noticed enlargement of the spleen and of the lymphatic glands; serofibrinous exudations in the body cavities; liver enlarged and engorged with blood; heart flabby; lungs, often with hemorrhagic herds, and subpleural emphysematous patches; catarrhal condition of the respiratory passages, and pathologic changes in the spinal cord.

The blood is infectious upon inoculation, but not upon ingestion; white and gray rats and mice, rabbits, guinea pigs (rarely), dogs, goats, sheep, chickens, turkeys, ducks, monkeys (*Nyctipithecus felinus*), and other animals are said to contract the disease upon inoculation.

Treatment with quinine, methylene blue, arsenic, enterol, permanganate of potassium, and other drugs has been without success.

[Since the above was sent to press, an extensive and valuable article on mal de caderas has been published by Voges (1902, pp. 323–372, pl. 5, figs. 1–7), to which the reader is referred for further details.]

TRYPANOSOMIASIS IN RATS AND BANDICOOTS.

RAT.

Considerable confusion has resulted in literature because of the misinterpretation of trypanosomiasis in rats. Thus the parasite of horse surra in India has been confused with the common trypanosome of Parisian and London rats. From present data it appears that rats (*Mus decumanus* and others) may harbor at least five species of *Trypanosoma*, namely: (1) *Trypanosoma Lewisi*, the form usually known as the rat trypanosome, and usually looked upon as a comparatively harmless organism. It is apparently quite common in rats in wet weather, while four other species—namely, (2) *Trypanosoma equiperdum*, the supposed cause of dourine; (3) *Trypanosoma Brucii*, the cause of tsetse-fly disease; (4) *Trypanosoma Evansi*, the cause of surra; and (5) *Trypanosoma equinum*, the cause of mal de caderas—are all transmissible to rats.

It is quite apparent from Lingard's accounts that he did not always distinguish between *Trypanosoma Lewisi* and *T. Evansi*, and this fact explains a number of apparently contradictory results in his experiments.

Thus, Lingard (1894a, pp. 4–5) says:

EXPERIMENTS ON ANIMALS WITH THE HEMATOZOON OF THE RAT.

"Proof was wanting that this hematozoon was capable of producing surra, when blood containing the organism was subcutaneously injected into horses and some other species of animals. As early as November, 1890, I commenced a series of experiments for the purpose of deciding the above question and obtained positive results, but found that the periods of incubation were more prolonged than in horse surra, in one case being as much as 63 days. Notwithstanding this, the virulence of the disease when once developed was intense, as shown by the short period during which the animal survived after the appearance of the hematozoon in the blood, this being in three cases only 2 to 5 days.

INOCULATION WITH THE SOILED BLOOD OF THE RAT (*Mus decumanus*).

"Of 12 horses inoculated with soiled rat's blood, 4 animals contracted surra, or 33.3 per cent:

(1) Period of incubation lasted 18 days; animal lived 19 days.
(2) Period of incubation lasted 29 days; animal lived 2 days.
(3) Period of incubation lasted 13 days; animal lived 2 days.
(4) Period of incubation lasted 63 days; animal lived 5 days.

"Although the latent period of rat surra was so prolonged in the first instance, when inoculated from rat to horse (average 40.7 days), it immediately returned to the normal period (average 7 to 8 days), when a second horse was inoculated with the blood of the first affected. The latent period, however, becomes still more reduced (5 days) when a third animal is inoculated with the blood of the second.

"2. Horses unsuccessfully inoculated and reinoculated subcutaneously with the rat hematozoon, when subsequently inoculated with horse surra blood show no protection from the former, but acquire the disease after an incubation period of 6 to 10 days.

"3. Animals other than horses which contracted the disease were bovines, monkeys, and field rats, while the rabbit, guinea pig, fowl, cat, dog, and donkey proved refractory to the rat hematozoon. But all the above animals with the exception of the fowl were very susceptible to the rat hematozoon when it had first been passed through the horse.

EXPERIMENTS ON THE GASTRIC INGESTION OF RATS' EXCREMENT.

"The above experiments raised the question as to how rats could cause the disease in horses; for the food would rarely if ever be soiled with the blood of these animals. It therefore only remained to be tried whether the excreta of rats, in whose blood the infusorian was present at the time of its collection, could cause the disease when mixed with grain.

"2. In 1892 experiments were undertaken at Poona, on the Deccan plateau, where the disease is not enzootic, and where the difficulty of producing it was fully recognized, owing to the dryness of the situation at that period of the year (December to February). These experiments, as expected, proved negative.

"3. At a later date, during the latter half of the hot season and the rains of 1893, further experiments with the same end in view were carried out in Bombay, where the climate is favorable from its humidity and the disease is enzootic. From these positive results were obtained, the incubation period occupying 4 months (about June to September); but the incubation period of the disease will probably be found to vary with the amount of moisture present in the atmosphere and amount of *materies morbi* ingested by the animal. This points to the probability of a number of the surra cases in Bombay being contracted through the ingestion of rats' or bandicoots' excreta mixed with the corn. Although not yet definitely proved, it is more than likely that the excreta of young and half-grown bandicoots have the same power of producing the disease, as the hematozoon is also frequently present in their circulation."

It seems to us that the above statements indicate very clearly that at least two species of *Trypanosoma* were present.

Despite this confusion, Lingard (1895, p. 10) presents some exceedingly interesting facts regarding trypanosomiasis in rats. Thus, from November, 1890, to May, 1895, the blood of 3,105 rats (*Mus decumanus*) was examined microscopically, and 1,084, or 34.91 per cent, were found to contain *Trypanosoma*, while in 2,021 cases, or 65.09 per cent, the examination was negative.

In an earlier paper Lingard (1894, pp. 3–4) brings out the following points, which are of interest in the way of comparison:

"Dividing the (Bombay) year into two periods—

(1) Dry and hot (January to May, inclusive),

(2) Rainy and humid (June to December, inclusive),

we find that during the period November [1890] to July, 1894, 421 out of a total ot 1,107 rats examined contained the hematozoon in their circulation. It was present in 31.53 per cent of the rats caught from January to May, and 40.31 per cent of those obtained from June to December, or during the rainy season. Although in the hot season the hematazoon is present in the circulation of these animals, the organisms are very few in number, while during the latter period of the year they are far more numerous, the percentage of cases in which the hematozoa are very numerous or swarming being 24 in the dry season and 52.61 in the rainy season, or in a ratio of 1 : 2.19.

"3. There is a tendency in the hematozoon to disappear from the circulation of some rats when kept in captivity and supplied with clean food and water.

"4. About 60 per cent of young rats from 2 to 4 months old have the hematozoon present in their circulation, and usually in large numbers.

"5. The blood of rats obtained from certain localities was almost always free from the hematozoon, while that of the majority of rats from other localities was affected.

"6. The hematozoon of the rat appears to disappear from the circulation at irregular intervals, thus producing paroxysms and intermissions, as in the case of surra in the horse.

"7. The presence in varying numbers of the hematozoon in the circulation of rats does not appear to produce any noticeable symptoms in the great majority of them. But some few rats whose blood swarmed with the hematozoon have succumbed to leucocytosis, with extravasations of blood containing the organism into the anterior chamber and vitreous humors of the eye, opacity of the cornea, enlarged spleens, and extravasations of blood, or in some cases ulceration of the mucous membrane of the stomach.

"8. It has been observed in a considerable number of cases that although the hematozoon may be present in vast numbers in the blood of pregnant rats (*Mus decumanus*), in no case has the hematozoon been discovered in the circulation of the fetus.

"9. *Parasites, stomach.*—Nematode worms varying in number and dimensions were found in the stomach of rats in which the hematozoon was either present or absent. In a total of 203 examined, nematodes were found in 40, or 19.75 per cent.

"10. *Saliva.*—Microscopical examination of saliva proved the absence of the *Trypanosoma* when the hematozoon was swarming in the blood at the same time. Immediately, however, a slight wound of the mucous membrane of the mouth was made, the organisms were discovered in varying numbers, according to the amount of blood mixed with the saliva.

"11. *Urine.*—The hematozoon was always absent from the urine of rats, although swarming in the circulation at the time of examination.

"12. *Bandicoots* (*Mus* (*Nesokia*) *giganteus*).—Previous observers have denied the presence of the hematozoon in the bandicoot, but as early as 1892 I demonstrated the presence of the organism in the blood of young and half-grown animals of this species, whether caught in Bombay and its surroundings or on the Deccan plateau, but it has been absent from all full-grown animals examined.

"13. *Muskrats* (*Sorex cœrulescens*) *and mice* (*Mus* species).—The hematozoon has not been found in the blood of these animals."

In his summary of 1895 Lingard (1895, pp. 11–13) adds the following interesting statement:

"3. It will be seen in column No. 8 that the percentage of rats in which the organisms were present in the circulation was highest during those months which included the monsoon season, namely, June to October, inclusive; and during the remaining months the percentage gradually decreased until April was reached. The difference between the maximum, 46.70, and the minimum, 23.47, percentages in July and April, respectively, is 23.23, or nearly half (50 per cent).

Table showing the ratio of spleen weight to body weight when the hematozoon is present or absent from the circulation of rats (Mus decumanus), *male and female, whose body weights are over or under 60 grams.*

Hematozoon present or absent in the blood.	Number of rats.	Males under 60 grams, ratio S. to B. W.	Number of rats.	Females under 60 grams, ratio S. to B. W.	Number of rats.	Males over 60 grams, S. to B. W.
Absent	186	1:228.4	171	1:232.2	455	1:205.5
Few	49	1:139.8	48	1:201.5	104	1:190.0
Numerous	44	1:136.6	32	1:166.8	37	1:154.3
Very numerous	47		28		22	
Swarming	78	1:107.2	55	1:119.2	23	1:137.9
Total	404	....	334	....	641	....
Present	218	1:125.7	163	1:157.4	186	1:169.1
Absent	186	1:228.4	171	1:232.2	455	1:205.5
Total	404	....	334	....	641	....

Hematozoon present or absent in the blood.	Number of rats.	Females over 60 grams, ratio S. to B. W.	Number of rats.	Males and females under 60 grams, ratio S. to B. W.	Number of rats.	Males and females over 60 grams, ratio S. to B. W.
Absent	578	1:203.3	357	1:230.3	1,033	1:204.3
Few	95	1:144.3	97	1:166.7	199	1:165.7
Numerous	29	1:137.4	76	1:147.4	66	1:146.9
Very numerous	23		76		45	
Swarming	22	1:087.5	133	1:112.0	45	1:108.1
Total	747	....	738	....	1,388	....
Present	169	1:131.2	381	1:139.3	355	1:149.9
Absent	578	1:203.3	357	1:230.3	1,033	1:204.3
Total	747	....	738	....	1,388	....

"5. It will be seen from the above table that the weight of the spleen increased (from a minimum in the absent cases) in regular gradation according to the number of hematozoa present in the circulation of the rats.

"6. *Pregnant.*—Of 2,154 rats examined 1,070 were males and 1,084 females. Seventy-seven females were pregnant, the hematozoon being present in the blood of 19 and absent from it in 58; or a percentage of 32.75, as against 67.25. In no instance has the *Trypanosoma* been discovered in the circulation of the fetus, although at the same time it was present in varying numbers in the blood of the mother.

"7. *Parasites* (stomach).—Nematode worms, varying in number and dimensions, were found in the stomachs of rats (in some instances the above organ was fully distended by the number of parasites), in which the hematozoon was either present or absent.

"In 2,154 examined during the year, nematodes were found in 23.58 per cent. But it is of interest to note that during the rainy season—June to November—the percentage was 16.27, whilst during the months December to May it rose to 29.36 per cent. The percentage varied during the twelve months from 7.25 in July to 37.50 in April.

"8. The great majority of rats present the hematozoon in their circulation sometime during the rainy season. From our observations the spleen attains its maximum size toward the end of the rains, and from that period the size of the organ gradually diminishes during the dry and hot season, until the advent of the following monsoon, unless occasional heavy rains fall between November and May.

"9. It has been observed during the middle of the hot and dry season that when rain suddenly falls after a long period of drought (4 months) the percentage of animals in which the hematozoon is found increases rapidly in the first few days (7) following the fall. The percentage then rapidly falls, and a second maximum is reached during the fourth week.

"The increase of percentage in the first week was found to be 7.5, while the maximum in the fourth week was 11 per cent.

EXPERIMENTS WITH THE HEMATOZOON OF THE RAT (*Mus decumanus*).

"Horses injected subcutaneously on numerous occasions with rat's blood containing swarms of the hematozoa proved refractory to the rat disease, but readily contracted surra in the usual period (5 to 7 days) when a small scratch on the muzzle was smeared with a trace of soiled guinea pig blood.

BANDICOOT.

EXPERIMENTAL INVESTIGATIONS RE HEMATOZOON IN BANDICOOTS.

Showing the bandicoots (Mus (Nesokia) giganteus) *examined from July, 1894, to end of April, 1895, and the relative number of hematozoa in their circulation.*

Hematozoa in blood.	In field of microscope.	Number of bandicoots.	Percentage.
Absent		112	74.66
Few	1 to 5	7	4.66
Numerous	5 to 20	8	5.33
Very numerous	20 to 50	12	8.00
Swarming	Over 50	11	7.33
Total		150	100.00
Absent		112	74.66
Present		38	25.33

"The experiments made during the past year confirm our last year's observations as to the presence of the *Trypanosoma* in the circulation of young and half-grown animals of this species and their almost entire absence from full-grown animals examined. This exception occurs during the wet season.

"2. Several varieties of the *Trypanosoma* have been found in the blood of bandicoots but they appear to belong to the same species.

"3. The difficulty experienced in obtaining bandicoots on the Deccan plateau militated against the attempt on our part to obtain a complete knowledge of the conditions of the blood of these animals during each month of the year. But it is more than probable from our present knowledge that the same changes with regard to the *Trypanosoma* during the dry and wet seasons occur in the circulation of bandicoots as those detailed as observed in the rat.

"4. Nematode worms, varying in numbers and dimensions (one-half to 5 inches in length) were found in the stomachs of bandicoots, in many instances completely distending the organs. In a total of 150 animals examined, nematodes were found in 90, or 60 per cent.

"5. The livers of these animals were also the seat of extensive changes caused by the presence of vast numbers of nematode eggs, some of which mature 'in situ,' and frequently the young worms escape into the peritoneal cavity.

"6. The chief pathological changes observed were ulceration (sometimes extensive) of the villous portion of the stomach, and, as an effect of the former, the formation of diverticula, the walls of the sac being formed of thickened peritoneum extravasations of blood under the submucous tissues, enlarged spleen (4 or 5 times normal), and less frequently abscess of liver, spleen, and subcutaneous tissues.

"7. As in the case of pregnant rats, so in that of pregnant bandicoots; although the *Trypanosoma* was present in vast numbers in the blood of the mother, in no instance has it been discovered in the circulation of the tetus.

"8. The blood of the majority of bandicoots during the rainy season was found to contain an exceedingly minute spirillum, even when the *Trypanosoma* was absent from their circulation. Rabbits and guinea pigs inoculated subcutaneously with blood containing this organism contracted the disease, and death resulted in the majority of instances.

INOCULATION OF ANIMALS WITH BANDICOOTS' BLOOD.

"1. The donkey proved refractory to the *Trypanosoma* of the bandicoot, although blood teeming with the organism was on numerous occasions subcutaneously injected.

"2. Except in one instance, when the hematozoon appeared on the fourth day after inoculation, and death occurred on the forty-first day, guinea pigs generally proved refractory to the soiled blood of the bandicoot. The same applies to rabbits.

"3. Rabbits and guinea pigs acquired no resistance even to the least virulent type of surra, when subcutaneously injected daily for varying periods, with large quantities of full-grown bandicoots' blood, *sine* hematozoon."

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The following bibliography is taken from the card catalogue of the Zoological Laboratory of this Bureau, and probably contains most of the titles bearing directly upon the subject under discussion.

For the benefit of Government officials, I have indicated the Governmental libraries where the works in question may be consulted, as follows:

W^a. Library of the United States Department of Agriculture.
W^c. Library of Congress.
W^m. Library of the Surgeon-General's Office.
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1900c.—Rapport sur les notes de MM. Buffard et Schneider, concernant l'étude expérimentale de la dourine du cheval, au nom d'une Commission composée de MM. Weber et Nocard, rapporteurs. [Same as Buffard & Schneider, 1900a] <Rev. vét., Toulouse, v. 25 (9), 1 sept., pp. 589–598. [W^a.]

1900d.—Idem. [Review of Buffard & Schneider, 1900b, by Victor E. Mertens] < Centralbl. f. Bakteriol., Parasitenk. [etc.], Jena, 1. Abt., v. 28 (25), 31. Dec., p. 882. [W^a.]

(1901).—Prophylaxie de la dourine. 15 pp. 8°. Lyon.

1902.—Parasitisme latent et immunisation dans la dourine <J. de méd. vét. et zootech., Lyon, v. 53, 5. s., v. 6, 31 mars, pp. 144–146. [W^a.]

Burke, Richard W.

1887a.—"Surra" or progressive pernicious anæmia <Vet. J., Lond., v. 25, July, pp. 5–11. [W^a.]

[Brief general discussion, containing much the same as his other articles, with the same general confusion of diseases.]

1887b.—Idem <J. Comp. M. & S., N. Y. & Phila., v. 8 (3), July, pp. 223–230. [W^a.]

1888a.—Surra, or pernicious anæmia in the lower animals <Vet. J., Lond., v. 26, Jan., pp. 1–12; Feb., pp. 83–86. [W^a.]

[General discussion; pernicious anemia; surra, beri-beri, kakke, or Burma disease, South Wales epizooty, all considered synonyms.]

1888b.—The discussion of the pathology of "surra" <Vet. J., Lond., v. 26, Apr., pp. 309–311. [W^a.]

[Reply to Steel, 1888a.]

1888c.—Harmless organisms found in the blood of horses <Veterinarian, Lond., v. 61 (732), Dec., pp. 785–787. [W^a.]

[Does not contain anything of importance.]

1889.—Micro-organisms and disease, especially with reference to the question, What is the pathology of "surra" in animals? <Vet. J. & Ann. Comp. Path., Lond., v. 28, Jan., pp. 25–27. [W^a.]

1891.—The general pathology of "surra" in animals <Vet. J., Lond., v. 33, Oct., pp. 264–272. [W^a.]

[A general review, with comparisons and summary of symptoms, pathology, and treatment.]

1897.—Malarial fever in horses in India, or "surra" <Veterinarian, Lond., v. 70 (832), Apr., pp. 185–194. [W^a.]

[In many respects surra in horses and malaria in man are practically identical; the parasites are identical; considers Texas fever a form of surra; article is quite similar to Burke, 1888a.]

BUTLER, R. C.

1888.—Surra in upper Burma <Quart. J. Vet. Sc. India, Madras, v. 6 (24), pt. 1, July, pp. 379–385. [W^{m}.]

CAPITAN.

1891.—Sur un hématozoaire du lapin domestique <Méd. mod., Par., v. 2 (13), 26 mars, pp. 239–240. [W^{m}.]

[Remarks on article by Jolyet & de Nabias, 1891.]

CAROUGEAU.

1901a.—Note relative à l'existence du Trypanosome en Indo-Chine <Bull. Soc. centr. de méd. vét., Par., 8. s., v. 8 (12), 30 juin, pp. 295–296. [W^{a}, W^{m}.]

1901b.—Nota relativa all' esistenza del "tripanosoma" nell' Indo-China <Gior. r. Soc. ed Accad. vet. ital., Torino, v. 50 (31), 3 agosto, pp. 748–749. [W^{a}.]

[Found *Trypanosoma* in horses at Pasteur Institute, Nha-Trang; inoculation experiments with horse, dog, rabbit, scimmia, rat, guinea pig.]

CARTER, H. VANDYKE.

1888a.—Note on the occurrence of a minute blood spirillum in an Indian rat <Scient. mem. med. off. India, Calcutta (1887), pt. 3, pp. 45–48, pl. 4. [W^{m}.]

1888b.—On the lately demonstrated blood-contamination and infective disease of the rat and of equines in India <Scient. mem. med. off. India, Calcutta (1887), pt. 3, pp. 49–78, pl. 5. [W^{m}.]

1888c.—Note on some aspects and relations of the blood organisms in ague <Scient. mem. med. off. India, Calcutta (1887), pt. 3, pp. 139–167. [W^{m}.]

1889.—On the lately demonstrated blood-contamination and infective diseases of the rat and of equines in India <Vet. J., Lond., v. 28, Mar., pp. 180–184; May, pp. 339–346; June, pp. 409–422. [W^{a}, W^{m}.]

[Identifies parasite of surra with that of rat; *Mus decumanus* and *M. rattus* (?) found infected; *M. bandicottus* and *Sorex* sp. not infected; in pregnant females, fetus not infected; increase of leucocytes; experiments with rat, dog, cat, monkey, horse, rabbit; general discussion.]

CERTES, A.

1882a.—Note sur les parasites et les commensaux de l'huître <Bull. Soc. zool. de France, Par., v. 7, séance 13 juin, pp. 347–353, pl. 7. [W^{a}.]

1882b.—Sur les parasites intestinaux de l'huître <Compt. rend. Acad. d. sc., Par., v. 95 (10), 4 sept., pp. 463–465. [W^{a}.]

1882c.—Idem <J. de microg., Par., v. 6 (10), oct., pp. 529–530. [W^{m}.]

1891.—Sur le *Trypanosoma Balbianii* <Bull. Soc. zool. de France, Par., v. 16 (3), mars, p. 95; (5), mai, pp. 130–131, 1 fig. [W^{a}.]

CHALACHNIKOW. *See* Schalaschnikoff, A.

CHASTREY, H.

1898.—La mouche tsétsé <Rev. scient., Par., 4. s., v. 9 (13), 26 mars, pp. 406–407. [W^{a}.]

CHAUSSAT, J. B.

1850.—Recherches microscopiques appliquées à la pathologie. Des hématozoaires. Thèse. 51 pp., 2 pls. 4°. Paris. [W^{m}.]

CHAUVRAT, J.

1896.—Un cas d'anémie pernicieuse du cheval en Algérie, causée par un Trypanosome <Rec. de méd. vét., Par., 8. s., v. 3 (11), 15 juin, pp. 344–348. [W^{a}, W^{m}.]

[Report of case; respiration, 21; temperature, 37.8–39.2; pulse, 92–104; autopsy notes; parasite 60 μ long; very similar to "*Trypanosomum Evansi.*"]

CLAUDE, A.

1897.—La mouche tsétsé et le guaco <Bull. Soc. méd. homœop. de France, Par., v. 21 (3), juillet, pp. 165–177. [W^{m}.]

COBBOLD, THOMAS SPENCER.

1879.—Parasites: A treatise on the Entozoa of man and animals, including some account of the Ectozoa. xi+508 pp., 85 figs. 8°. London. [W^{a}.]

[Pp. 273, 307, 351, 388, very brief mention of *Glossina morsitans.*]

CROOKSHANK, EDGAR M.

1886.—On flagellated Protozoa in the blood of diseased and apparently healthy animals <J. Roy. Micr. Soc., Lond., 2. s., v. 6 (6), Dec., pp. 913–928, figs. 193–198, pl. 17. [W^{m}.]

[*Trichomonas Lewisi*, p. 928.]

1887.—Photomicrographs of flagellated Protozoa in the blood <J. Roy. Micr. Soc., Lond., 2. s., v. 7 (2), Apr., p. 358. [W^{m}.]

1896.—A text-book of bacteriology, including the etiology and prevention of infective diseases, and a short account of yeasts and molds, hæmatozoa, and psorosperms. 4. ed., xxx+715 pp., 273 figs., 22 pls. 8°. London. [W^{m}.]

CUNNINGHAM, D. DOUGLAS.

1888.—1. On the occurrence of peculiar organisms in the blood of horses and their supposed pathogenic nature. (*In his* Notes from the biological laboratory attached to the office of the sanitary commissioner with the government of India) <Scient. mem. med. off. India, Calcutta (1887), pt. 3, pp. 1–4, pl. 1, fig. 1. [W^{m}.]

CURRY, J. J.

1902.—Report on a parasitic disease in horses, mules, and caribao in the Philippine Islands. [From a report made to the Surgeon-General of the Army, Dec. 17, 1901] <Am. Med., Phila., v. 3 (13), Mar. 29, pp. 512–513. [W^{a}.]

DANILEWSKY, B.

1885.—Zur Parasitologie des Blutes <Biol. Centralbl., Erlang., v. 5 (17), 1. Nov., pp. 529–537. [W^{m}.]

1886a.—Matériaux pour servir à la parasitologie du sang <Arch. slaves de biol., Par., v. 1 (1), 15 jan., pp. 85–91. [W^{m}.]

1886b.—Recherches sur la parasitologie du sang. [Continuation of Danilewsky, 1886a] <Arch. slaves de biol., Par., v. 1 (2), 15 mars, pp. 364–396, pls. 5–6. [W^{m}.]

1886c.—Zur Frage über die Identität der pathogenen Blutparasiten des Menschen und der Haematozoen der gesunden Tiere <Centralbl. f. d. med. Wissensch., Berl., v. 24 (41), 9. Oct., pp. 737–739; (42), 16. Oct., pp. 753–755. [W^{m}.]

1887a.—Contribution à la question de l'identité des parasites pathogènes du sang chez l'homme avec les hématozoaires chez les animaux sains <Arch. slaves de biol., Par., v. 3 (2), 15 mars, pp. 257–264. [W^{m}.]

1887b.—Recherches sur la parasitologie du sang. [Continuation of Danilewsky 1886b] <Arch. slaves de biol., Par., v. 3 (1), 15 jan., pp. 33–49; (2), 15 mars, pp. 157–176, pls. 1–2; (3), 15 mai, pp. 370–417. [W^{m}.]

1889a.—La parasitologie comparée du sang. I. Nouvelles recherches sur les parasites du sang des oiseaux. 93 pp., 3 pls. 8°. Karkoff. [W^{a}.]

[Pp. 52–79, discussion of several forms, with great confusion of the technical names.]

1889b.—La parasitologie comparée du sang. II. Recherches sur les hématozoaires des tortues. 86 pp., 2 pls. 8°. Karkoff. [W^{a}.]

Davaine, Casimir Joseph.

1877.—Traité des Entozoaires et des maladies vermineuses de l'homme et des animaux domestiques. 2. éd., cxxxii + 1003 pp., 110 figs. 8°. Paris. [W^a.]

Delages, Yoes, & Hérouard, Edgard.

1896.—Traité de zoologie concrète. v. 1, La cellule et les Protozoaires. xxx + 584 pp., 870 figs. 8°. Paris. [W^a.]

de Does, J. K. F.

1901a.—Bijdrage tot de kennis der Trypanosomen-ziekten, in het bijzonder die, welke op Java voorkomen <Veearts. Bladen v. Nederl.-Indië, Batavia, v. 13 (3–4), pp. 313–347. [W^a.]

(1901b).—Bijdrage tot de kennis der Trypanosomen-ziekten, in het bijzonder die, welke op Java voorkomen <Geneesk. Tijdschr. v. Nederl.-Indië, v. 41 (1), pp. 138–175.

1901c.—Boosaardige dekziekte in het soemedangsche. III^e rapport <Veearts. Bladen v. nederl.-Indië, Batavia, v. 14, pp. 20–45, figs. [W^a.]

Doflein, F.

1901.—Die Protozoen als Parasiten und Krankheitserreger nach biologischen Geschichtspunkten dargestellt. xiii + 274 pp., 220 figs. 8°. Jena. [W^a.]

[An excellent work on parasitic Protozoa. Actual date of publication, July 1, 1901.]

Durham, H. E. (*See also* Kanthack, Durham, & Blandford.)

1898.—Tsetse disease <Veterinarian, Lond., v. 71 (850), Oct., pp. 535–538. [W^a.]

[Summary of a paper read before the Fourth International Zoological Congress, Cambridge (Eng.), 1898.]

Eberth.

(1861).—Ueber ein neues Infusorium im Darm verschiedener Vögel <Ztschr. f. wissensch. Zool., Leipz., v. 11 (1), p. 98.

Elmassian, M.

1901a.—Mal de Caderas <Berl. thierärztl. Wchnschr. (40), 3. Okt., p. 604, 1 fig. [W^a.]

1901b.—Idem. [Reviewed by Railliet] <Rec. de méd. vét., Par., 8. s., v. 8 (23), 15 déc., pp. 786–788. [W^a.]

Evans, George H.

1899.—Some notes on surra in Burmah. Outbreak amongst military police ponies at Mandalay, July, 1896. (*In* Lingard, 1899, v. 2, pt. 1, pp. 37–41.) [W^a.]

Evans, Griffith.

(1880).—Report on "surra" disease in the Dera Ismail Khan district, November 13, 1880, Military Department, No. 493–4467.

1881.—On a horse disease in India known as "surra," probably due to a Hæmatozoon <Vet. J., Lond., v. 13, July, pp. 1–10; [Aug., pp. 83–88]; Sept., pp. 180–200; Nov., pp. 326–333. [W^a.]

[Excellent article; geographical distribution; definition; symptoms; postmortem appearances; mortality; contagion and infection; believes flies may carry the disease; different animals affected—horse, mule, camel; remote causes; prevention; cure; no confidence in carbolic acid; the parasite; history of individual cases, with accounts of treatment and tables of pulse, temperature, and urine.]

1882.—Idem. [Continued] <Vet. J., Lond., v. 14, Feb., pp. 97–110; Mar., pp. 181–187. [W^a.]

[Cases; sanitary condition of the horse lines; outbreaks.]

Friedberger, Franz, & Fröhner, Eugen.

1889.—Lehrbuch der speciellen Pathologie und Therapie der Hausthiere. Für Thierärzte, Ärzte und Studirende. 2. ed., v. 2, viii + 793 pp. 8°. Stuttgart. [W^{a}.]

[P. 737, Cadeiras-Krankheit-mal de caderas.]

Fröhner, Eugen. *See* Friedberger, Franz, & Fröhner, Eugen.

Gaule, J.

1880.—Beobachtungen der farblosen Elemente de Froschblutes <Arch. f. Physiol., Leipz. (4–5), 1. Oct., pp. 375–392, pl. 5. [W^{m}.]

Gluge, G.

1842.—Ueber ein eigenthümliches Entozoon im Blute des Frosches <Arch. f. Anat., Physiol. u. wissensch. Med., Berl., p. 148. [W^{m}.]

Grassi, B.

1881.—Intorno ad alcuni protisti endoparassitici ed appartenenti alle classi dei flagellati lobosi, sporozoi e ciliati <Atti Soc. ital. d. sc. nat., Milano, v. 24, pp. 135–224, pls. 1–4. [W^{a}.]

1883.—Sur quelques protistes endo-parasites appartenant aux classes des flagellata, lobosa, sporozoa et ciliata. [Transl. of Grassi, 1881] <Arch. ital. de biol., Turin (1882), v. 2 (3), 1 fév., pp. 402–444; v. 3 (1), 15 avril, pp. 23–37, pls. 1–3. [W^{m}.]

Gros.

1845.—Observations et inductions microscopiques sur quelques parasites <Bull. Soc. imp. d. nat. de Moscou, v. 18, pt. 1 (1), pp. 380–428, pls. 9–11. [W^{a}.]

Gruby, David.

1843.—Recherches et observations sur une nouvelle espèce d'Hématozoaires, *Trypanosoma sanguinis* <Compt. rend. Acad. d. sc., Par., v. 17, 2. semestre (20), pp. 1134–1136. [W^{a}.]

1844a.—Idem <Ann. d. sc. nat., Zool., Par., 3. s., v. 1, pp. 104–107, pl. 1B, figs. 1–7. [W^{a}.]

1844b.—On a new species of Hæmatozoon, *Trypanosoma sanguinis.* [Transl. of Gruby, 1843] <Ann. Mag. Nat. Hist., Lond., v. 13 (82), Feb., pp. 158–159. [W^{a}.]

Gunn, W. D.

1891.—The etiology of surra. [Criticism of Ranking, 1891a] <Vet. J., Lond., v. 33, Oct., pp. 309–310. [W^{a}.]

Hassall, Albert.

1902.—Bibliography of surra and allied trypanosomatic diseases <Bull. No. 42, Bureau Animal Indust., U. S. Dept. Agric., Wash., pp. 131–148. [W^{a}.]

Hayes, M. H.

1898.—Surra. (*In* Friedberger and Fröhner's Veterinary Pathology. Infective Diseases of Animals. Translated and edited by M. H. Hayes, with notes on Bacteriology by G. Neumann. 8°. London.) [W^{a}.]

[Pp. 477–487, chapter on surra, written by Hayes and based largely on Lingard.]

Hérouard, Edgard. *See* Delages, Yoes, & Hérouard, Edgard.

Jolyet, F., & de Nabias, B.

1891.—Sur un hématozoaire du lapin domestique <J. de méd. de Bordeaux, v. 20 (31), 1 mars, pp. 325–326. [W^{m}.]

Kanthack, A. A., Durham, H. E., & Blandford, W. F. H.

1898a.—On nagana or tsetse fly disease. (Report made to the tsetse fly committee of the Royal society of observations and experiments carried out from November, 1896, to August, 1898) <Proc. Roy. Soc. Lond. (Nov., 1898–Mar., 1899), v. 64 (404), Nov. 19, pp. 100–118. [W^m.]

1898b.—Nagana or tsetse fly disease. [Review of Kanthack, Durham, & Blandford, 1898a] <Brit. M. J., Lond. (1980), Dec. 10, pp. 1768–1769. [W^a.]

1898c.—Ueber Nagana oder die Tse-tse Fliegenkrankheit. [Transl. of Kanthack, Durham, & Blandford, 1898a, by G. H. F. Nuttall] <Hyg. Rundschau, Berl., v. 8 (24), 15. Dec., pp. 1185–1202, 1 fig. [W^a, W^m.]

1898d.—Idem [abstracted] <J. Comp. Path. & Therap., Edinb. & Lond., v. 11 (4), Dec. 31, pp. 370–380. [W^m.]

1899a.—Tsetse disease in mammals <Proc. Fourth Internat. Cong. Zool., Cambridge (22–27 Aug., 1898), Lond., pp. 166–168. [Lib. Stiles.]

[Practically the same as Durham, 1898, pp. 535–538.]

1899b.—On nagana or tsetse fly disease <Veterinarian, Lond., v. 72 (853), Jan., pp. 1–11; (854), Feb., pp. 68–79. [W^a.]

[Same as Kanthack, Durham, & Blandford, 1898a.]

Kempner, Walter. *See* Rabinowitsch, Lydia, & Kempner, Walter.

Kent, W. Saville.

1880.—A manual of the Infusoria, including a description of all known flagellate, ciliate, and tentaculiferous Protozoa, British and foreign, and an account of the organization and affinities of the sponges. Pts. 1–3, pp. 1–432, pls. 1–24. 8°. London. [W^m.]

[*Trypanosoma*, pp. 218–220.]

Kinyoun, J. J. *See* Smith, Allen M., & Kinyoun, J. J.

Koch, Robert.

1881.—Zur Untersuchung von pathogenen Organismen <Mitth. a. d. k. Gsndhtsamte, Berl., v. 1, pp. 1–42, pls. 1–14. [W^a.]

1898a.—"Reise-Berichte über Rinderpest, Bubonenpest in Indien und Afrika, Tsetse- oder Surrakrankheit, Texas-Fieber, tropische Malaria, Schwarzwasserfieber." 136 pp., 10 figs. 8°. Berlin. [W^m.]

1898b.—Report on the surra disease <Brit. M. J., Lond., v. 1 (1945), Apr. 9, p. 983. [W^a.]

[Brief reference to Koch's report from Dar-es-Salam; mules and ordinary donkeys subject to surra, but masai donkeys are apparently immune.]

Kruse, W.

1896.—Systematik der Protozoen. (*In Flügge's* Die Mikroorganismen. Mit besonderer Berücksichtigung der Ätiologie der Infektionskrankheiten. 3. ed., pt. 2, pp. 601–700, figs. 128–153.) [W^m.]

[*Trichomonas columbarum*, *T. intestinalis*, *T. vaginalis*, pp. 629–632.]

Künstler, G.

1883.—Recherches sur les Infusoires parasites. Sur quinze Protozoaires nouveaux <Compt. rend. Acad. d. sc., Par., v. 97, 2. semestre (14), 1 oct., pp. 755–757. [W^a, W^m.]

Labbé, Alphonse.

1891.—Note sur un nouveau parasite du sang (*Trypanomonas Danilewskyi*) <Bull. Soc. zool. de France, Par., v. 16, oct., pp. 229-231. [W^a.]

Laboulbène, A.

1888.—Sur une mouche tsé-tsé de l'Afrique australe <Bull. Acad. de méd., Par., An. 52, 2. s., v. 19 (22), 4 juin, pp. 721-724. [W^m.]

de Lacerda, J. B.

1885.—Pathogenesia comparada. Peste de Cadeiras ou epizootia de Marajó suas analogias com o Beriberi. viii + 98 pp. 3 pls., 2 phot. 8°. Rio de Janeiro. [W^{m}.]

de Lanessan, J. L.

1882a.—Manuel d'histoire naturelle médicale. Pt. 3, Zoologie, 728 pp., 523 figs. 12°. Paris. [W^{a}.]

[P. 71, fig. 60, brief mention of *Undulina ranarum.*]

1882b.—Traité de zoologie, Protozoaires. vii + 336 pp., 281 figs. 8°. Paris. [W^{a}.]

[Pp. 166–167, fig. 142, brief reference to "*Trypanosoma sanguinis* Gruby" and *Trypanosoma Eberthi.*]

Lankester, E. Ray.

1871.—On *Undulina*, the type of a new group of Infusoria <Quart. J. Micr. Sc., Lond., n. s., v. 11 (44), Oct., pp. 387–389, figs. 1–4. [W^{m}.]

[Living parasites found in frog's blood described as *Undulina ranarum.*]

1882.—On *Drepanidium ranarum*, the cell-parasite of the frog's blood and spleen (Gaule's Würmschen) <Quart. J. Micr. Sc., Lond., n. s., v. 22 (85), Jan., pp. 53–65, figs. 1–5. [W^{m}.]

Laveran, Alphonse. (*See also* Laveran, Alphonse, & Mesnil, F.)

1892.—Des Trypanosomes parasites du sang <Arch. de méd. expér. et d'anat. path., Par., 1. s., v. 1 (2), 1 mars, pp. 257–269, pl. 1. [W^{a}, W^{m}.]

1893.—Paludism. xii + 197 pp., 7 figs., 6 pls. 8°. London. [W^{a}.]

1895.—Les Hématozoaires de l'homme et des animaux. Pt. 1, Protozoaires du sang, iv + 154 pp., 9 figs. Paris. [Lib. Stiles.]

[Account of *Trypanosoma* in various animals, pp. 129–149.]

Laveran, Alphonse, & Mesnil, F.

1900a.—De la longue conservation à la glacière des Trypanosomes du rat et de l'agglomération de ces parasites <Compt. rend. Soc. de biol., Par., v. 52 (29), 12 oct., pp. 816–819. [W^{a}.]

[Describes agglutination.]

1900b.—Sur l'agglutination des Trypanosomes du rat par divers sérums <Compt. rend. Soc. de biol., Par., v. 52 (34), 16 nov., pp. 939–942. [W^{a}.]

[Experimented with serum of dog, rabbit, sheep, horse, chicken, pigeon, rat.]

1901a.—Sur le mode de multiplication du Trypanosome du nagana <Compt. rend. Soc. de biol., Par., v. 53 (12), 29 mars, pp. 326–329. [W^{a}.]

[Description and figures of division.]

1901b.—Sur la nature centrosomique du corpuscule chromatique postérieur des Trypanosomes <Compt. rend. Soc. de biol., Par., v. 53 (12), 29 mars, pp. 329–331. [W^{a}.]

[Homologous with the attractive spheres of *Noctiluca* and centrosomes of spermatoids.]

1901c.—Sur la structure du Trypanosome des grenouilles et sur l'extension du genre *Trypanosoma* Gruby <Compt. rend. Soc. de biol., Par., v. 53 (23), 28 juin, pp. 678–680, figs. 1–3. [W^{a}.]

[Genus *Herpetomonas* is discarded.]

1901d.—Sur la morphologie et la systématique des Flagellés à membrane ondulante (genres *Trypanosoma* Gruby et *Trichomonas* Donné) <Compt. rend. Acad. d. sc., Par., v. 133 (3), 15 juillet, pp. 131–137, figs. 1–5. [W^{a}.]

[General discussion; important.]

LAVERAN, ALPHONSE, & MESNIL, F.—Continued.

1901e.—Recherches morphologiques et expérimentales sur le Trypanosome des rats (*Tr. Lewisi* Kent) <Ann. de l'Inst. Pasteur, Par., v. 15 (9), 25 sept., pp. 673–714, pls. 11–12. [W^{a}.]

[Very important paper.]

1901f.—Sur la nature bactérienne du prétendu Trypanosome des huitres (*Tryp. Balbianii* Certes) <Compt. rend. Soc. de biol., Par., v. 53 (31), 25 oct., pp. 883–885. [W^{a}.]

[*Trypanosoma Balbianii* does not belong to the genus *Trypanosoma*.]

1901g.—Sur les Flagellés à membrane ondulante des poissons (genres *Trypanosoma* Gruby et *Trypanoplasma* n. gen.) <Compt. rend. Acad. d. sc., Par., v. 133 (18), 28 oct., pp. 670–675. [W^{a}.]

[Three new species.]

1902a.—Recherches morphologiques et expérimentales sur le Trypanosome du nagana ou maladie de la mouche tsétsé <Ann. de l'Inst. Pasteur, Par., v. 16 (1), 25 jan., pp. 1–55, figs. [W^{a}.]

1902b.—Study of the *Trypanosoma* of tsetse fly disease. [Abstract of Laveran & Mesnil, 1902a] <J. Am. M. Ass., Chicago, v. 38 (11), Mar. 15, p. 738. [W^{a}.]

1902c.—Morphological and experimental researches on *Trypanosoma* of rats (*T. Lewisi*). [Review of Laveran & Mesnil, 1901e] <Exp. Sta. Rec., U. S. Dept. Agric., Wash., D. C., v. 13 (6), p. 532. [W^{a}.]

LECLER, M.

1899.—El mal de caderas (contribucion al estudio de esta enfermedad). 15 pp. 4°. Buenos Aires. [W^{a}.]

LECLERCQ, EMMA.

1890.—Les microorganismes intermédiaires aux deux règnes <Bull. Soc. belge de Micr., Brux., v. 16 (8), pp. 70–131, figs. 1–7. [W^{m}.]

LEES, KAY.

1888.—*Glossina morsitans* or tsetse fly <Vet. J. & Ann. Comp. Path., Lond., v. 27, Aug., pp. 79–84. [W^{m}.]

[Claims to have found the tsetse fly in India, Naga Hills; heavy losses in transport service; quotes Dr. Livingstone's observations on the tsetse fly.]

LEWIS, TIMOTHY RICHARDS.

1878.—The microscopic organisms found in the blood of man and animals, and their relation to disease <14th Ann. Rep. San. Com. India, Calcutta (1877), Appendix B, pp. 157–208, figs. 1–27, pls. 1–3. [W^{m}.]

1879.—Flagellated organisms in the blood of healthy rats <Quart. J. Micr. Sc., Lond., n. s., v. 19 (73), Jan., pp. 109–114, 1. fig. [W^{m}.]

1884.—Further observations on flagellated organisms in the blood of animals. <Quart. J. Micr. Sc., Lond., n. s., v. 24 (96), July, pp. 357–369, figs. 1–5. [W^{m}.]

1888.—Flagellated organisms in the blood of animals. (*In* Physiological and pathological researches; being a reprint of the principal scientific writings of the late Timothy Richards Lewis. Arranged and edited by William Aitken, G. E. Dobson, and A. E. Brown. 8°. London. pp. 604–609.) [W^{m}.]

LINGARD, ALFRED.

1893.—Report on horse surra. v. 1, 125+cclxxix pp., 11 pls. fol. Bombay. [W^{a}.]

[Exceedingly important medical discussion; most extensive paper on surra in print].

Lingard, Alfred—Continued.

1894a.—Summary of further report on surra. 8 pp. fol. Bombay. [W^{a}.]

1894b.—Idem <Vet. J., Lond., v. 39 (232), Oct., pp. 250–258; (233), Nov., pp. 311–315. [W^{m}.]

1894c.—The disease surra in solipeds and camels. [Review of Lingard, 1893] <Vet. J., Lond., v. 38, Mar., pp. 172–175. [W^{a}.]

1895.—Summary of further report on surra. 13 pp. fol. Bombay. [W^{a}.]

1896.—Annual report of the imperial bacteriologist for the official year 1895–96. 61 pp., 1 map. 4°. Bombay. [W^{a}.]

1898a.—Annual report of the imperial bacteriologist for the official year 1896–97. iii+77 pp. fol. [Calcutta.] [W^{a}.]

1898b.—Surra report. Appendices, including records of cases, charts, and illustrations. v. 2, pt. 2, 230 pp., 3 pls. fol. Bombay. [W^{a}.]

1899.—Report on surra in equines, bovines, buffaloes, and canines, together with an account of experiments conducted with the *Trypanosoma* of rats, bandicoots, and fish. v. 2, pt. 1, ii+160 pp., pls. 1–2. fol. Bombay. [W^{a}.]

[Very important.]

1900.—Report on surra, disease in horses. [Review of Lingard, 1899] <Vet. J., Lond., n. s., v. 2 (11), o. s., v. 51 (305), Nov., pp. 340–345. [W^{a}.]

1901.—Report on surra in equines, bovines, buffaloes, and canines, etc. [Review of Lingard, 1899, by Railliet] <Rec. de. méd. vét., Par., 8. s., v. 8, 15. juin, pp. 377–378. [W^{a}.]

Livingston, David.

1858a.—The tsetse. (*In his* Missionary travels and researches in South Africa, including a sketch of sixteen years' residence in the interior of Africa and a journey from the Cape of Good Hope to Loanda on the west coast, thence across the continent, down the river Zambesi to the eastern coast. 8°. New York. pp. 93–97, 612–613, figs. 1–3.) [W^{a}.]

1858b.—Arsenic as a remedy for the tsetse bite <Brit. M. J., Lond., n. s. (70), May 1, pp. 360–361. [W^{m}.]

Lühe, Max.

1900a.—Ergebnisse der neueren Sporozoenforschung. Zusammenfassende Darstellung, mit besonderer Berücksichtigung der Malaria-Parasiten und ihrer nächsten Verwandten <Centralbl., f. Bakteriol., Parasitenk. [etc.], Jena, 1. Abt., v. 27 (10–11), 23. März, pp. 367–384, figs. 1–9; (12–13), 31. März, pp. 436–460, figs. 1–9; v. 28 (6–7), 22. Aug., pp. 205–209; (8–9), 4. Sept., pp. 258–264, figs. 1–6; (10–11), 20. Sept., pp. 316–324, figs. 7–10; (12–13), 6. Okt., pp. 384–392. [W^{a}.]

[*Trypanosoma*, p. 443.]

1900b.—Ergebnisse der neuern Sporozoen-Forschung. Zusammenfassende Darstellung mit besonderer Berücksichtigung der Malariaparasiten und ihrer nächsten Verwandten. iv + 100 pp., 35 figs. 8°. Jena. [W^{a}.]

[Reprint of Lühe, 1900a, with additions.]

de Lustrac, A.

1896.—*Trypanosoma Balbianii*, Certes <Actes Soc. Linn. de Bordeaux, v. 50, 5. s., v. 10, pp. 265–275, pls. 1–2. [W^{c}.]

McWeeney, E. J.

1899.—Reports on recent bacteriological and hygienic researches. II. Koch's work on the plague in Africa, tsetse fly disease, and Texas fever <J. State M., Lond., v. 7 (2), Feb., pp. 115–120. [W^{m}.]

Malkmus, Bernard.

1901.—Outlines of clinical diagnostics of the internal diseases of domestic animals, translated from the latest German edition by D. S. White & Paul Fischer. 205 pp., 45 figs. 8°. Chicago. [W^{c}.]

Marotel, G.

1902.—Les hématozoaires et leurs modes de transmission <J. de méd. vét. et zootech., Lyon, 5. s., v. 6, 28 fév., pp. 97–107. [W^{a}.]

Marshall, W.

1885.—Ueber die Tsetsefliege <Biol. Centralbl., Erlang., v. 5 (6), 15. Mai, pp. 183–184. [W^{m}.]

[Maus, L. M.]

1902.—A new epidemic disease among horses in the Philippine Islands <Phila. M. J., v. 9 (4), Jan. 25, p. 149. [W^{a}.]

Maxwell, Thomas.

1857.—On "surrah" <Indian Ann. M. Sc., Calcutta, v. 4, Apr., pp. 441–447. [W^{m}.]

Mayer, A. F. I. Carolus.

1843.—Specilegium observationum anatomicarum de organo electrico in Raiis anelectricis et de Hæmatozois. 17 pp., 3 pls. 4°. Bonnæ. [W^{a}.]

Med. Rec., N. Y.

1902a.—Surra among the army mules in the Philippines <Med. Rec., N. Y., v. 61 (6), Feb. 8, p. 221. [W^{a}.]

1902b.—Treatment and prevention of "surra" in horses, mules and other animals. [Review of circular, Jan. 11, Military Governor, Philippines] <Med. Rec., N. Y., v. 61 (11), Mar. 15, p. 420. [W^{a}.]

Mégnin, J. P.

1875a.—Mémoire sur la question du transport et de l'inoculation de virus par les mouches <J. de l'anat. et physiol. [etc.], Par., v. 11 (2), mars-avril, pp. 121–133, pl. 7. [W^{m}.]

1875b.—Du rôle des mouches dans la propagation du charbon et autres affections virulentes <J. de méd. vét. mil., Par., v. 12 (8), jan., pp. 461–475. [W^{m}.] [Tsétsé, pp. 471 ff.]

Mesnil, F. *See* Laveran, Alphonse, & Mesnil, F.

Mitrophanow, P.

1883.—Beiträge zur Kenntniss der Hämatozoen. Neue monadenförmige Parasiten des Fischbluts, ihnen ähnliche Organismen und ihre Beziehung zu den Blutelmenten <Biol. Centralbl., Erlang., v. 3 (2), 15. März, pp. 35–44, figs. 1–2. [W^{m}.]

Möbius, K.

1883.—*Trypanosoma Balbianii* Certes im Krystallstiel schleswig-holsteinischer Austern <Zool. Anz., Leipz., v. 4 (134), 19. März, p. 148. [W^{m}.]

de Nabias, B. *See* Jolyet, F., & de Nabias, B.

Nariman & Vaz.

1893.—The disease "surra" <Vet. J., Lond., v. 36, June, pp. 403–406. [W^{a}.] [No practical treatment found; excrements and breath highly offensive; sporadic cases in every season throughout the year; communicable to all species of domesticated animals (mammals); temperature in febrile attack 104° to 106° F.; symptoms; diagnosis; post-mortem appearances; treatment, inhalations of carbolic acid, 1 oz., in closed room, or hypodermic injections, 2 grains corrosive sublimate in a solution with common salt.]

Nepveu, G.

1898.—Sur un Trypanosome dans le sang de l'homme <Compt. rend. Soc. de biol., Par., 10. s., v. 5 (41), 30 déc., pp. 1172-1174. [W^a.]

[Gives an alleged occurrence of *Trypanosoma* in man; description incomplete.]

Neumann, L. G.

1888.—Traité des maladies parasitaires non microbiennes des animaux domestiques. xv + 673 pp., 306 figs. 8°. Paris. [W^a.]

[Pp. 33-34, brief reference to tsetse fly, with quotation on the disease taken from Railliet; p. 557, brief reference to Künstler, 1883, p. 775.]

1892a.—Idem. 2. éd. xvi + 767 pp., 364 figs. 8°. Paris. [W^a.]

[Pp. 35-36, brief account of the tsetse fly, copied from Railliet; p. 631, brief reference to *Trypanosoma* in rabbit (Jolyet & de Nabias, 1891), and guinea pig (Künstler, 1883); p. 626 mentions *Trypanosoma sanguinis avium* of Danilewsky.]

1892b.—A treatise on the parasites and the parasitic diseases of the domesticated animals, translated and edited by George Flemming. xxiii, +800 pp., 364 figs. 8°. London. [W^a.]

[Pp. 34-36, brief account of tsetse fly, copied from Railliet; p. 619-622, surra; p. 635, *Trypanosoma* in rabbit (Jolyet & de Nabias, 1891), and in guinea pig (Künstler, 1883); p. 649 mentions *Trypanosoma sanguinis avium* of Danilewsky.]

Nocard.

1901a.—Sur les rapports qui existent entre la dourine et le surra ou le nagana <Compt. rend. Soc. de biol., Par., v. 53 (16), 10 mai, pp. 464-466. [W^a.]

1901b.—Idem [reviewed] <Rec. de méd. vét., Par., 8. s., v. 8 (11), 15 juin, pp. 379-380. [W^a.]

Nockolds, Coleman.

1901.—"Surra" in the Philippines <Am. Vet. Rev., N. Y., v. 25 (9), Dec., pp. 743-745. [W^a.]

1902.—Some further remarks on "surra" <Am. Vet. Rev., N. Y., v. 25 (11), Feb., pp. 900-903. [W^a.]

Nuttall, George H. F.

1898.—Neuere Untersuchungen über Malaria, Texasfieber und Tsetsefliegenkrankheit. Zusammenfassender Bericht <Hyg. Rundschau, Berl., v. 8 (22), 15. Nov., pp. 1084-1102. [W^a.]

[An excellent digest of recent literature.]

1899.—Die Rolle der Insekten, Arachniden (*Ixodes*) und Myriapoden als Trägen bei der Verbreitung von durch Bakterien und thierische Parasiten verursachten Krankheiten des Menschen und der Thiere. Eine kritisch-historische Studie <Hyg. Rundschau, Berl., v. 9 (5), 1. März, pp. 209-220; (6), 15. März, pp. 275-289; (8), 15. Apr., pp. 393-408; (10), 15. Mai, pp. 503-520; (12), 15. Juni, pp. 606-620. [W^a.]

[An excellent critical digest of subject indicated in title; extensive bibliography; this paper should be read by all interested in the subject.]

Osborn, Herbert.

1896.—Insects affecting domestic animals; an account of the species of importance in North America, with mention of related forms occurring on other animals. Bull. No. 5, n. s., U. S. Dept. Agric., Div. Entom., 302 pp., 170 figs. 8°. Washington, D. C. [W^a.]

[Pp. 133-134, brief mention of the tsetse fly.]

OSLER, WILLIAM.

1887.—An address on the hæmatozoa of malaria <Brit. M. J., Lond., v. 1 (1367), Mar. 12, pp. 556–562, figs. 1–15. [W^{a}.]

[Refers to the work of Evans, Steel, Lewis, Crookshank, Mitrophanow and Danilewsky on surra and *Trypanosoma*.]

OSWELL, W.

1852.—Sur une mouche venimeuse de l'Afrique méridionale <Compt. rend. Acad. d. sc., Par., v. 35 (16), 2. sémestre, pp. 560–561. [W^{a}.]

1853.—Giftige Fliege in Süd-Africa. [Review of Oswell, 1852] <Repert. d. Thierh., Stuttg., v. 14, p. 367. [W^{m}.]

PEASE, H. J.

1897.—Surra and malarial fever <Veterinarian, Lond., v. 70 (838), Oct., pp. 549–565, figs. [W^{a}.]

[Caustic criticism of Burke, 1897; general discussion of surra, comparing it with other diseases.]

PENNING, C. A.

1900a.—Verdere Waarnemingen betreffende Surra in Nederl.-Indië <Veearts. Bladen v. Nederl.-Indië, Batavia, v. 13 (1), Mai, pp. 25–52, pl. 1. [W^{a}.]

1900b.—Verdere Waarnemingen betreffende Surra in Ned.-Indië. [Review of Penning, 1900a, by Tjaden] <Centralbl. f. Bakteriol., Parasitenk. [etc.], Jena, 1. Abt., v. 28 (18), 17. Nov., pp. 613–614. [W^{a}.]

PFEIFFER, L.

1889.—Beiträge zur Kenntniss der pathogenen Gregarinen. III. Ueber Gregarinose, ansteckendes Epitheliom und Flagellaten-Diphtherie der Vögel <Ztschr. f. Hyg., Leipz., v. 5 (3), 31. Jan., pp. 363–401, figs. 1–15, pl. 3. [W^{a}.]

PLIMMER, H. G., & BRADFORD, J. ROSE.

1899a.—A preliminary note on the morphology and distribution of the organism found in the tsetse fly disease <Veterinarian, Lond., v. 72 (861), Sept., pp. 648–657. [W^{a}.]

[Reprinted from Nature. Description of adult *Trypanosoma Brucii;* distribution of parasite in body; infectivity, life history.]

1899b.—Vorläufige Notiz über die Morphologie und Verbreitung des in der Tsetsekrankheit ("Fly Disease" oder "Nagana") gefundenen Parasiten. [Transl. of Plimmer & Bradford, 1899a] <Centralbl. f. Bakteriol., Parasitenk. [etc.], Jena, 1. Abt., v. 26 (14–15), 28. Okt., pp. 440–447. [W^{a}.]

[Description of "*Trypanosoma Brucii;*" its distribution in the body; blood of dead animals loses power of infection twenty-four hours after death; life cycle of parasite.]

RABINOWITSCH, LYDIA, & KEMPNER, WALTER.

1899.—Beitrag zur Kenntniss der Blutparasiten, speciell der Rattentrypanosomen <Ztschr. f. Hyg., Leipz., v. 30 (2), 18. Apr., pp. 251–294, pl. 2. [W^{a}.]

[Review of literature; morphology and development; longitudinal and transverse division; segmentation; infection experiments; active and passive immunity; infection by fleas.]

RAILLIET, ALCIDE.

1884.—Du rôle de la tsétsé dans la propagation des maladies <Bull. Soc. centr. de méd. vét., Par., v. 38, n. s., v. 2, pp. 79–80. [W^{a}.]

[*Glossina morsitans,* probably a carrier of infectious material rather than a poisonous insect.]

1893.—Traité de zoologie médicale et agricole. v. 1, 736 pp., 494 figs. 8°. Paris. [W^{a}.]

1895.—Idem. v. 2, pp. 737–1303, figs. 495–892. 8°. Paris. [W^{a}.]

[Pp. 787–788, *Glossina morsitans* and nagana, brief general discussion.]

Ranking, George.

1891a.—A preliminary note on the nature and pathology of the disease known as "surra" affecting horses and mules in India <Vet. J., Lond., v. 32, June, pp. 399–405. [W^{a}.]

[Surra is a disease of malarial origin; changes in blood, "echinosis," and plasmodic; claims to have found and cultivated a "bacillus;" describes spores which were also found in water. (*See also* Gunn, 1891, pp. 309–310.).]

1891b.—Surra in horses. [Reply to Gunn, 1891] <Vet. J., Lond., v. 33, Dec., pp. 402–403. [W^{a}.]

Rattig, A.

(1875).—Über Parasiten des Froschblutes. Diss. 29 pp., 1 pl. Berlin.

Rayer, P.

1843.—Des vers qu'on rencontrée dans le sang de certains animaux <Arch. de méd. comp., Par., v. 1, pp. 40–45. [W^{m}.]

Rebourgeon.

1889.—Note sur le mal de Cadeiras (Vulgo: Quebra-bunda) <Rec. de méd. vét., Par., v. 66, 7. s., v. 6 (3), 15 fév., pp. 85-93. [W^{a}.]

Rec. de Méd. Vét., Par.

1896.—Le Trypanosome du bœuf et les tsétsés <Rec. de méd. vét., Par., 8. s., v. 3 (7), 15 avril, p. 266. [W^{a}.]

[Review of article in Progrès by Régulato on observation by Legrain of a trypanosome in sort of varicose dilatations developed on external surface of pericardium of cow slaughtered at abattoir at Bougie; also mentions Bruce, 1894, Brit. M. J.]

Ringe, R. H.

1887.—"Surra" in grass-cutters' ponies <Quart. J. Vet. Sc. India, Madras, v. 6 (21), Oct., pp. 47–49, temperature chart. [W^{m}.]

Rogers, Leonard. [Indian Med. Service.]

1901.—The transmission of the *Trypanosoma Evansi* by horse flies, and other experiments pointing to the probable identity of surra of India and nagana or tsetse-fly disease of Africa. [Read before Tsetse-fly Committee, Roy. Soc., Feb. 14, 1901] <Proc. Roy. Soc., Lond., v. 58 (444), May 4, pp. 163–170. [W^{m}.]

Ross, Ronald. *See* Brit. M. J.

Rost, E. R.

1901.—Report on the possibility of treating "surra" by infections of an antiparasitic serum <J. Path. & Bacteriol., Edinb. & Lond., v. 7 (3), June, pp. 285–290. [W^{m}.]

Rouget, J. [Algeria.]

1896.—Contribution à l'étude du Trypanosome des mammifères <Ann. de l'Inst. Pasteur, Par., v. 10 (12), déc., pp. 716–728, figs. 2, 3, 5. [W^{a}.]

[*Trypanosoma* in horse; description; inoculations of cold-blooded animals and birds negative; of guinea pig negative; positive in white and gray mice, white rat, rabbit, dog, results fatal; on sewer rats positive and negative; one case of possible transmission (rabbit) by coitus; ingestion experiments negative; horse from which original material came had dourine; serum-therapy.]

1900.—Sang coloré contenant des Trypanosomes <J. de méd. de Bordeaux, v. 30 (1), 7 jan., p. 12. [W^{m}.]

[Short communication on dourine.]

Salmon, Daniel Elmer, & Stiles, Ch. Wardell.

1902.—Emergency report on surra <Bull. No. 42, Bureau Animal Indust., U. S. Dept. Agric., Wash., pp. 1-130, figs. 1-112. [W^a.]

Schalaschnikoff [Chalachnikow], A.

(1888).—Recherches sur les parasites du sang. Kharkov.

1889.—Izslied. nad Krovoparazit. cholod. i teplskrov. jivotnych. [Researches on parasitology of blood in cold and warm blooded animals] <Sborn. trud. Charkov. Vet. Inst., v. 1, pp. 195-304, 3 pls. [W^m.]

Schneidemühl, Georg.

1896.—Lehrbuch der vergleichenden Pathologie und Therapie des Menschen und der Hausthiere für Thierärzte, Ärzte und Studirende. pp. 209-448. 8°. Leipzig. [W^a.]

[P. 268, very brief reference to surra, with confusion of pernicious anemia in man.]

Schneider, G. *See* Buffard, M., & Schneider, G.

Schoch, G. M. T.

1883.—Die Tsetsefliege Afrikas <Mitth d. schweiz. entom. Gesellsch., Schaffhausen, v. 6 (10), Oct., pp. 685-686. [W^a.]

Slee, John G.

1902a.—Notes on a new disease of horses <Am. Vet. Rev., N. Y., v. 25 (10), Jan., pp. 819-821. [W^a.]

1902b.—Idem <Bull. No. 42, Bureau Animal Indust., U. S. Dept. Agric., Wash., pp. 12-13. [W^a.]

Smith, Allen M., & Kinyoun, J. J.

1901a.—A preliminary note on parasitic disease of horses. 3 pp., 2 photomicrographs (Army Pathological Laboratory), Manila, P. I. [W^m.]

1901b.—Idem. Reprint, with additions by Allen M. Smith. General Orders, No. 390, Headquarters Div. of Philippines, Manila, P. I., Dec. 11.

1902.—Idem <Bull. No. 42, Bureau Animal Indust., U. S. Dept. Agric., Wash., pp. 13-15. [W^a.]

Smith, Fred.

1886.—Fieber <Encycl. d. ges. Thierh. u. Thierzucht, Wien & Leipz., v. 3, pp. 133-134. [W^a.]

Steel, John Henry.

1881.—A treatise on the disease of the ox; being a manual of bovine pathology especially adapted for the use of veterinary practitioners and students. xxi + 498 pp., 116 figs. 8°. London. [W^a.]

(1885).—An investigation into an obscure and fatal disease among transport mules in British Burma.

1886a.—On relapsing fever of equines <Vet. J., Lond., v. 22, Mar., pp. 166-174, 1 fig.; Apr., pp. 248-257. [W^a.]

[Excellent short discussion on temperature; parasites, gross pathology in mules; transmission to dogs, case fatal; transmission to ordinary Burmese monkey, case fatal; compares the disease with relapsing fever of man, which he thinks is closely allied.]

1886b.—Fieber <Encycl d. ges. Thierh. u. Thierzucht (Koch), Wien & Leipz., v. 3, pp. 134-137, fig. 539. [W^a.]

[Gives short discussion.]

1888a.—A veterinary glimpse at the last Burma war. [Editorial] <Quart. J. Vet. Sc. India, Madras, v. 6 (22), Jan., pp. 135-144. [W^m.]

1888b.—Le surra, maladie contagieuse des animaux domestiques, dans l'Inde <Rec. de méd. vét., Par., 7. s., v. 5 (9), 15 mai, pp. 298-304. [W^a.]

[Résumé of Steel, probably 1881-1882, not accessible to us.]

Stiles, Ch. Wardell. (*See also* Salmon, Daniel Elmer, & Stiles, Ch. Wardell.)

1902.—*Trypanosoma* in a new rôle <Am. Med., Phila., v. 3 (6), Feb. 8, pp. 240–241. [W^{a}.]

Stordy, Robert J.

1899.—The Uganda transport—"through the tsetse fly belt of British East Africa" <Veterinarian, Lond., v. 72 (853), Jan., pp. 11–20, figs. 1–8, 1 map. [W^{a}.]

[Mules were given balls composed of arsenic, quinine, and gentian, then all animals smeared with solution of Jeyes fluid, and ponies arrayed in pajamas, see fig. 88.]

Theiler, A.

1901a.—Die Tsetse-Krankheit <Schweiz.-Arch. f. Thierh., Zürich, v. 43 (3), Mai-Juni, pp. 97–112; (4), Juli-Aug., pp. 153–162. [W^{m}.]

[P. 162. Incurable; quinine per os and subcutaneously; also arsenic and other drugs tried.]

1901b.—Idem. [Reviewed by Francke] <Berl. thierärztl. Wchnschr. (52), 26. Dez., pp. 794–796. [W^{a}.]

Valentin, G.

1841.—Ueber ein Entozoon im Blute von *Salmo fario* <Arch. f. Anat., Physiol. u. wissensch. Med., Berl., pp. 435–436, pl. 15, fig. 16. [W^{m}.]

Vaz. *See* Nariman & Vaz.

Veterinarian, Lond.

1890.—Notes on "surra" <Veterinarian, Lond., v. 63 (745), Jan., pp. 1–3. [W^{a}.]

[Brief editorial, referring to Burke, Lewis, Crookshank, Steel, Cunningham, and Carter.]

1891.—Surra <Veterinarian, Lond., v. 64 (759), Mar., pp. 169–170. [W^{a}.]

[Short note quoted from The Field, Lond.]

Vet. J., Lond.

1889.—The tzetze fly and man <Vet. J., Lond., v. 28, Feb., pp. 140–141. [W^{a}.]

[Cause a condition resembling urticaria, intense itching at night, and preventing sleep.]

1894.—The disease surra in solipeds and camels. [Review of Lingard, 1893, v. 1] <Vet. J., Lond., v. 38, Mar., pp. 172–175. [W^{a}.]

1896.—Surra. [In part, a review of Lingard, 1895] <Vet. J., Lond., v. 42 (249), Mar., pp. 177–183. [W^{a}.]

Voges, O.

1901a—Das Mal de Caderas der Pferde in Südamerika <Berl. thierärztl. Wchnschr. (40), 3. Okt., pp. 597–598. [W^{a}.]

1901b.—Le Mal de Caderas des chevaux dans l'Amérique du sud. [Review of Voges, 1901a, by Railliet] <Rec. de méd. vét., Par., 8. s., v. 8 (23), 15 déc., pp. 788–789. [W^{a}.]

1902.—Das Mal de Caderas <Ztschr. f. Hyg. u. Infectionskrankh., Leipz., v. 39 (3), 13. März, pp. 323–372, pl. 5, figs. 1–7. [W^{a}.]

Vrijburg, A.

1900.—Surra <Veearts. Bladen v. Nederl.-Indië, Batavia, v. 13 (1), Mai, pp. 53–58. [W^{a}.]

1902.—Surra <Veearts. Bladen v. nederl.-Indie, Batavia, v. 14 (3), pp. 207–215, 1 pl. [W^{a}.]

Walley, Ralph St. John.

1893.—Surra in fox-hounds <J. Comp. Path. & Therap., Edinb. & Lond., v. 6 (3), Sept. 30, pp. 285–286. [W^{a}.]

WEDL, C.

1850.—Beiträge zur Lehre von den Hämatozoen <Denkschr. d. k. Akad. d Wissensch., math.-nat. Cl., Wien, v. 1, 2. Abt., pp. 15–25, 1 pl. [W^a.]

WEICHSELBAUM, ANTON.

1898.—Parasitologie <Handb. d. Hyg., Jena, v. 9, Lief. 2, pp. x+63–336, figs. 1–78. [W^a.]

[*Trypanosoma sanguinis*, p. 285.]

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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY—BULLETIN No. 43.
D. E. SALMON, D. V. M., Chief of Bureau.

STATE AND TERRITORIAL LAWS

RELATING TO

CONTAGIOUS AND INFECTIOUS DISEASES OF ANIMALS.

1901.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Animal Industry,
Washington, D. C., July 22, 1902.

Sir: I have the honor to transmit herewith copies of State and Territorial laws relating to contagious and infectious diseases of animals which were enacted during the year 1901, and suggest that these be published as Bulletin No. 43 of this Bureau. Heretofore it has been the custom to publish these laws biennially in the report of this Bureau, but they have become so voluminous that they take up much space in that volume which it is deemed can be better utilized for articles of more general interest. While it is important that these laws be published, it is believed that a limited edition in bulletin form will answer all requirements.

Respectfully,

D. E. Salmon,
Chief of Bureau.

Hon. J. H. Brigham, *Acting Secretary.*

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LAWS FOR THE CONTROL OF CONTAGIOUS DISEASES OF ANIMALS.

ARIZONA.

AN ACT Entitled "An act to amend an act to codify and revise the laws with reference to live stock," being act 6, of the nineteenth legislative assembly of the Territory of Arizona.

Be it enacted by the Legislative Assembly of the Territory of Arizona:

Amending law of 1897. SECTION 1. Amend section 2, eighth line, by striking out the words "twelve hundred" and insert in place thereof "eighteen hundred."

SEC. 2. Amend section 15, last line, by striking out the word "fifty" and insert in place thereof "one hundred."

SEC. 3. Amend section 37 to read as follows:

Slaughter license, bond, etc. "Any person or persons, firm, or corporation engaged in the slaughter of live stock for sale in this Territory, shall slaughter all such animals in a fixed and definite slaughterhouse or slaughter pen, to be kept by such person or persons for that purpose; and before such person, persons, firm, or corporation shall begin, enter upon, or carry on the business of slaughtering any neat or horned cattle, swine, sheep, or goats for sale, or for the sale of meat, or selling or exposing for sale the meat of such animals in the Territory of Arizona, such person, persons, firm, or corporation shall first procure from the live stock sanitary board a license to operate such slaughtering business, and to sell or expose for sale such meat, under the conditions and upon payment of the fees herein provided, and after procuring such license, and before engaging in such business, such person, or persons shall execute upon a blank form furnished by the said board a bond with two or more good and sufficient sureties to the Territory of Arizona in the penal sum of one thousand dollars ($1,000), to be approved by the chairman of the board of supervisors of the county in which such business is to be carried on, conditioned that such person, persons, firm, or corporation shall not slaughter or expose for sale any neat animal or the meat thereof without first being the legal and equitable owner thereof, as well in law as in fact, and in case such person, persons, firm, or corporation shall slaughter or sell or expose for sale any neat animal, or the meat thereof as aforesaid, shall pay therefor double the value of any such animal, the same to be recovered by action on the said bond in the name of the true owner of such animal; the amount so recovered shall be paid as follows: One-half to the owner of such animal, one-fourth to the inspector or person discovering the wrongful possession or slaughtering of such animal, and the remaining one-fourth to the license and inspection fund herein provided for; and the compliance with all the provisions of this act applying to butchers.

"The live stock sanitary board shall grant to each and every applicant therefor, upon the payment of the fees herein provided, a license to slaughter horned and neat cattle, swine, sheep, and goats as may be set forth in such application for the term of one year from the date that such license is granted. If the business is to be carried on within, or within four miles of, any town of more than five thousand inhabitants, the applicant shall pay to the board the sum of one hundred and fifty dollars ($150) for a license to operate such business of slaughtering, at a fixed and definite slaughtering place; in case the business is to be carried on within, or within four miles of, any town or village of more than three thousand and less than five thousand inhabitants, the applicant shall pay to the board one hundred and twenty dollars ($120) for such slaughtering license; in case the business is to be carried on within, or within four miles of, any town or village of over one thousand and less than three thousand inhabitants, the applicant shall pay to the board ninety dollars

($90) for such slaughtering license; and in all other cases thirty dollars ($30) for such slaughtering license: *Provided*, That all persons, firms, or corporations engaged in the said business prior to the passage of this act shall be allowed thirty days from and after the passage of this act in which to procure such license and file such bond. Each and every license issued under this act shall be for one specific place of business, and the location of the place of business for which it is issued shall be stated therein.

"The applicant for such license shall make written application to the board therefor, and state in his application where his slaughterhouse or slaughter pen is or will be located during the term for which such license is issued, and he shall not, during the term for which such license is issued, slaughter any neat or horned cattle, swine, sheep, or goats at any other place than that specified in his license: *Provided*, That if for any reason the holder of a license desires to change the location of any such slaughtering place he shall apply to the said board to have such license transferred to cover such change. And said board shall reissue such license on application therefor for the unexpired term of such license: *Provided*, That any person, persons, firm, or corporation who shall slaughter or cause to be slaughtered more than two head of cattle or more than six head of hogs, sheep, or goats for the sale of meat in any one month shall be considered butchers within the meaning of this act."

SEC. 4. Amend section 39, in the eleventh line, by striking out the word "twenty," and in the thirteenth and fourteenth lines by striking out the words "which amount shall be deducted from the purchase price," and in the fifteenth line by striking out the word "ages."

SEC. 5. Amend section 40, the tenth line, by striking out the word "twenty."

SEC. 6. Amend section 41 to read as follows:

License and inspection fund. "All moneys received by the board for the licenses provided for in this act shall be turned over to the Territorial treasurer to be deposited in a special fund, to be known as the 'license and inspection fund,' and such fund shall be subject only to warrants drawn by the Territorial auditor on demand of the chairman of the live stock sanitary board, duly countersigned by the secretary, for the payment of slaughterhouse inspectors: *Provided*, That no slaughterhouse inspector shall receive less than fifty per cent or more than ninety per cent per annum of all such license fees paid from or within his district. Such payments to be made quarterly, and any and all balance remaining in such fund after paying such warrants shall, at the end of each fiscal year, be turned over to the general fund of the Territory, on demand of the said board.

Untagged hides must not be purchased. "It shall be unlawful for any trader or other person to purchase or otherwise acquire possession of any hide of horned or neat cattle until the same shall have been inspected and tagged, as required by the provisions of this act, and the possession of any untagged hide shall be considered prima facie evidence of a misdemeanor, unless the person possessing such hide can show that the same was taken from an animal owned by him at the time of slaughter or death, or that he had written authority from the owner to remove such hide from the animal."

SEC. 7. Amend section 42, in the sixth and seventh lines, by striking out the words "ages and weight."

SEC. 8. Amend section 43, first line, by striking out the words "railroad company," and insert in place thereof the words "person or common carrier," and in the third and fourth lines by striking out the words "railroad company" and inserting in place thereof the words "person or common carrier."

SEC. 9. Amend section 44 to read as follows:

Owners must have mark and brand. "Every person, firm, company, or corporation owning horses, mules, asses, or neat cattle in this Territory shall have and adopt a mark and brand for such animals, and every person, firm, company, or corporation owning sheep and goats in this Territory shall have and adopt an earmark or brand, or both, different from his neighbor, and, as far as practicable, different from any other earmark or brand in the Territory, by which they [the animals] shall be marked and branded, after such earmark or brand shall have been recorded as required by this act: *Provided*, That any and all brands and earmarks of sheep and goats now on record in the office of the live-stock sanitary board are hereby legalized."

SEC. 10. Amend section 58 by inserting the words "upon demand of purchase" at the beginning of section.

SEC. 11. All the acts and parts of acts in conflict with this act are hereby repealed.

SEC. 12. The repeal of the foregoing sections, acts, and parts of acts shall in no way affect any rights that have accrued, or any actions pending.

SEC. 13. This act shall take effect and be in force from and after its passage.

Approved March 21, 1901.

REVISED STATUTES, 1901. TITLE 42. LIVE STOCK.

Live-stock sanitary board. SECTION 1. Three commissioners identified with and experienced in the live-stock interests of the Territory of Arizona shall be appointed by the governor, with the advice and consent of the legislative council, who shall constitute the live-stock sanitary board of the Territory of Arizona.

Qualification of members. SEC. 2. Before entering upon the duties of his office each commissioner shall take and subscribe to the oath of office according to law, and file the same with the secretary of the Territory; and each commissioner before entering upon the performance of his duties shall execute a bond in the sum of two thousand dollars ($2,000), conditioned that he will faithfully perform the duties of his office, which bond shall be approved by the governor and filed in the office of the secretary of the Territory.

Term of office. The term of office of the first commissioner named by the governor shall be for three years from the first day of April, 1897; the second one named shall be for two years, and the third one named shall be for one year from said first day of April, 1897, and the successors of each shall be appointed for the term of three years thereafter. The governor shall have power to fill vacancies in said board. Said board shall elect one of their number chairman. The board shall keep a full and complete record of their proceedings, and make such report to the governor as may from time to time be required, and a biennial report to the legislative assembly, such report to be made in triplicate.

Salary. The members of the board appointed by the governor as hereinbefore provided shall receive ten dollars ($10) per day for the time by them necessarily employed in discharging the duties required by this title: *Provided, however*, That in no one year shall the board be in session more than sixty days, except upon call of the governor; and each member of the board shall receive five (5) cents for each and every mile actually traveled, which per diem and mileage shall be paid on the warrant of the auditor, to be issued on the filing of an itemized account therefor in the auditor's office, properly certified thereto by such member, duly countersigned by the secretary, with the seal of the board and approval of its chairman; but before any mileage shall be allowed or paid, the one claiming the mileage shall make and file with the territorial auditor his affidavit, stating the distance traveled, the most direct route from his home to the place of the meeting of the board.

Veterinary surgeon. SEC. 3. The governor shall nominate and, by and with the advice and consent of the legislative council, appoint a skilled veterinary surgeon for the Territory of Arizona, who, at the date of such appointment, shall be a graduate in good standing of a recognized college of veterinary surgeons, and who shall hold his office for the term of two years, unless sooner removed by the board; the salary of said veterinary surgeon shall be the sum of eighteen hundred dollars ($1,800) per annum, and ten (10) cents per mile for each mile actually and necessarily traveled in the discharge of his duties. Before entering upon the discharge of his duties, the territorial veterinarian shall take and subscribe an oath to faithfully perform the duties of his said office, and shall execute a bond to the Territory of Arizona in the sum of five thousand dollars ($5,000), with good and sufficient sureties, conditioned for the faithful performance of the duties of his office, which bond and sureties thereto shall be approved by the governor; and said bond, together with his oath of office, shall be deposited in the office of the secretary of the Territory.

Owners to report disease. SEC. 4. It shall be the duty of any owner or person in charge of any domestic animal or animals, who discovers, suspects, or has reason to believe that any of his domestic animals, or domestic animals in his charge, are affected with any infectious or contagious disease, to immediately notify such fact, belief, or suspicion to the board or any member of it, or to the Territorial veterinarian; and it shall be the duty of any person who discovers the existence of any contagious or infectious disease among the domestic animals of another to report the same to the said board or Territorial veterinarian, and any attempt to conceal the existence of such disease, or to wilfully or maliciously obstruct or resist said board or the Territorial veterinarian in the discharge of their duties, as herein set forth, shall be deemed a misdemeanor.

Duties of board. SEC. 5. It shall be the duty of the board provided for in the first section of this title to protect the health of the domestic animals of the Territory from all contagious and infectious diseases of a malignant character, and for this purpose it is hereby authorized and empowered to establish, maintain, and enforce such quarantine, sanitary, and other regulations, including methods of disinfecting railroad cars, as it may deem necessary. It shall be the duty of any member of said board, upon receipt by him of reliable information of the existence among the domestic animals of the Territory of any malignant disease, to immediately notify the Territorial veterinarian, who shall go at once to the place where any such disease is alleged to exist, and make a careful examination of the animals believed to be affected with any such disease, and ascertain, if possible, what, if any, disease exists among the live stock reported to be affected, and whether the same is contagious or infectious or not, and if said disease is found to be of a malignant, contagious, or infectious character he shall direct a temporary quarantine and sanitary regulations necessary to prevent the spread of any such disease, and report forthwith his findings and action to the chairman of the board.

Action of board. SEC. 6. Upon the receipt of [by] the chairman of the board of the report of the Territorial veterinarian provided for in the next preceding section, he shall immediately, if the exigencies of the case require it, convene the board at the most convenient place, and, if upon consideration of the report of the veterinarian, the board shall be satisfied that any contagious or infectious disease exist which seriously affects the health of domestic animals, they shall, after ascertaining and determining the extent of premises or grounds infected, authorize the veterinarian to establish the quarantine, sanitary and police regulations necessary to circumscribe and exterminate such disease; and no domestic animal liable to become infected with the disease, or capable of communicating the same, shall be permitted to leave the district, premises, or grounds so quarantined, except by the authority of the veterinarian. The said board shall prescribe such rules and regulations as will enable the veterinarian to perfectly isolate the disease and exposed animals from all other domestic animals which are susceptible of becoming infected with the disease; they shall also, from time [to time] prescribe and enforce such directions, rules, and regulations as to separating, mode of handling, treating, feeding, and caring for such infected or diseased and exposed animals as it shall deem necessary to prevent the two classes of animals from coming in contact with each other, and the said board or any of the members thereof, or said veterinarian, are hereby authorized and empowered to enter upon any grounds or premises to carry out provisions of this title.

Quarantine, etc. SEC. 7. When the said board shall have determined the quarantine and other regulations necessary to prevent the spread among domestic animals of any maligant, contagious, or infectious disease found to exist among the live stock of the Territory, and given its orders as hereinbefore provided, prescribing quarantine and other regulations, it shall notify the governor thereof, who shall issue his proclamatian, proclaiming the boundary of such quarantine, and the orders, rules, and regulations prescribed by the board, which proclamation may be published by written or printed handbills posted within the boundaries or on the lines of the district, premises, places, or grounds so quarantined, or by being published in the stock papers of the Territory: *Provided*, That if the board decides that it is not necessary, by reason of the limited extent of the district in which such disease exists, that a proclamation should be issued, then none shall be issued, but the board shall give such notice as to it shall seem best to make the quarantine established effective.

Slaughter of animals. SEC. 8. In any case of epidemic disease where premises have been previously quarantined by the Territorial veterinarian, as before provided, he is further authorized and empowered, when in his judgment necessary, by and with the consent of the said board, to order the slaughter of any or of all diseased animals upon said premises, and of all animals that have been exposed to contagion or infection, under the following restrictions: The order for slaughter shall be in writing, and shall be made in duplicate; and there shall be a distinct order and a duplicate for each owner of the animal or animals condemned, the original of each order to be filed in the office of the said board and the duplicate given to the said owner. And further, before slaughtering any animal or animals that have been exposed only and do not show disease, the veterinarian shall call in consultation with him two reputable practicing veterinarians or physicians, residents of the Territory, or if this is impracticable, then two reputable and well-known stock owners, residents of the Territory, and shall have the written endorsement upon his orders of at least one of said consulting physicians or stock owners stating that said action is necessary, and the consent in writing of the owner or person in charge, before such animal or animals shall be slaughtered. It shall be the duty of the Territorial veterinarian to superintend the slaughtering of such animals as may be condemned, and also the destruction of the carcass, causing the same to be destroyed as cheaply as practicable, which destruction shall be by burning to ashes, and shall include every part of the animal and hide, and also excrement and stable bedding or corral litter, as far as possible.

Penalty for disposing of diseased animals.

SEC. 9. Any person, persons, firm, or corporation who shall have in his possession any domestic animal affected with any contagious or infectious disease, knowing such animal to be so affected, or, after having received notice that such animal is so affected, who shall sell, drive, ship, trade, or give away such diseased animal or animals which have been exposed to such infection or contagion, sheep infected with scab upon the range excepted, or who shall move or drive any domestic animal in violation of any direction, rule, regulation, or order establishing and regulating quarantines, shall be deemed guilty of a misdemeanor: *Provided*, That any owner of any domestic animal which has been affected with or exposed to any contagious or infectious disease may dispose of the same after having obtained from the Territorial veterinarian a bill of health of such animal. It shall be unlawful to kill for butcher purposes any diseased animal, to sell, give away, or use any part of it, or its milk, or to remove any part of the skin.

Quarantine against other States.

SEC. 10. Whenever the said board shall have good reason to believe that any contagious or infectious disease exists in any other State, Territory, or countries, or that there are conditions that render domestic animals from such districts liable to convey such disease, they shall report the same to the governor. Thereupon the governor shall by proclamation prohibit the importation of any live stock of the kind diseased in the Territory, unless accompanied with a certificate of health given by a duly authorized State or Territorial veterinarian; and all such animals arriving in this Territory shall be examined upon arrival by the Territorial veterinary surgeon, and if deemed necessary placed in close quarantine until all danger of infection is passed, when they shall be released by order of the Territorial veterinarian. All expense connected with such examination shall be paid by the owner or owners of such stock.

Transportation of diseased animals.

SEC. 11. It shall be unlawful for any person, persons, firm, or corporation to drive or transport or cause to be driven or transported into the Territory of Arizona any live stock from those States, Territories, or countries against which the governor has proclaimed a quarantine, as hereby provided for in the preceding section: *Provided*, That cattle in transit through the Territory on a railroad, when not unloaded, are not liable to any penalties attached to this title; otherwise the regulations contained herein shall apply as well to those animals in transit through the Territory as to those resident therein; and the said board, a member thereof, or the Territorial veterinary surgeon shall have full authority to examine, whether in yards or pasture or stables or upon the public domain, all animals passing through the Territory or any part of it, and, on detection or suspicion of disease, to take possession of and treat and dispose of said animals in the same manner as is prescribed for animals resident in the Territory.

Penalty for importing diseased animals.

SEC. 12. Any person, persons, firm, corporation, owner, or agent who shall knowingly bring into this Territory any domestic animal or animals infected with any contagious or infectious disease, or any animal or animals which have been exposed to any contagious or infectious disease, shall be deemed guilty of a misdemeanor.

General penalty for evading this title.

SEC. 13. Except as otherwise provided in this title, any person, persons, firm, corporation, owner, or agent who shall violate, disregard, or evade or attempt to violate, disregard, or evade any of the provisions of this title, or who shall violate, disregard, or evade, or attempt to violate, disregard, or evade any of the rules, regulations, orders, or directions of the said board establishing and governing quarantine, shall be deemed guilty of a misdemeanor; and any person, persons, firm, corporation, owner, or agent who violate any of the provisions hereof shall be guilty of a misdemeanor, and, upon conviction thereof in any court of competent jurisdiction, shall be fined not less than fifty ($50) nor more than three hundred dollars ($300), and shall be liable for any damage that may be sustained by reason of their failure to comply with the provisions of said sections.

Board may employ assistance. SEC. 14. The said board shall have the power to employ such persons and purchase such supplies and material as may be necessary to carry into full effect all orders by it given, as hereinbefore provided; that no laborer shall be employed, or material or supplies purchased by the said board, except such additional labor, material, and supplies as may be necessary to carry into effect the quarantine and other regulations prescribed by the said board.

Officers must obey orders of board. SEC. 15. The said commissioners shall have the power to call upon any sheriff, under sheriff, deputy sheriff, constable, cattle inspector, or detective to execute their orders, and such officers shall obey the orders of said board; and the officers performing such duties shall receive compensation therefor as is prescribed by laws for like services; and any officer may arrest on view, and take before any magistrate of the county any person found violating any of the provisions hereof; and such officer shall immediately notify the district attorney of such county of such arrest, and he shall prosecute the person so offending according to law.

Board to protect stock. SEC. 16. The board is hereby authorized, and it is made its duty, to exercise a general supervision over, and so far as may be to protect the stock interests of the Territory from theft; and in furtherance of this object the said board shall devise and recommend from time to time such legislation as in their judgment will foster this important industry; and shall appoint such inspectors as they may deem necessary for the better protection of the live-stock interests of the Territory.

Inspectors. Said inspectors shall be under the exclusive direction and control of the board, and shall report to it all their official acts, as prescribed in the rules and regulations of the board.

Secretary of board. The board shall cause to be kept in a safe place a permanent record of their own acts, and of all official reports of inspectors, and may appoint a secretary and pay him, for the clerical work and keeping the records of the inspection service, a sum not exceeding one hundred dollars ($100) per month.

System of inspection. SEC. 17. The board shall devise a system of inspection for health and for marks and brands of all stock exported from the Territory, of all stock slaughtered in the Territory, and of all stock that may be driven from one range to another in the Territory; and shall prescribe rules and regulations for the seizure and selling of stray stock in the brand of unknown owners; and all stock running in unrecorded brands; for discovering unknown owners, and for remitting to them the proceeds of such sale, if such owners be the bona fide and lawful owners thereof. They shall furnish suitable blanks in triplicate, upon which all inspectors shall keep a record of their inspection, and upon which they shall report to the board all inspections made; the inspection reports, whether in the hands of the inspector or in the office of the board, shall at all times be open to any person or persons desiring to examine them, and the secretary of the board shall give to any person inquiring, any desired information obtainable from the inspection records.

Powers of inspectors. SEC. 18. The inspectors are empowered, and it shall be their duty, to arrrest all persons who violate the stock laws of this Territory, and shall, upon information that any person or persons have committed any crime or misdemeanor against the laws of this Territory, in feloniously marking or branding any stock, or other crime or misdemeanor under the laws of this Territory, for the protection of the rights and interests of stock owners, make the necessary affidavit for the arrest and examination of such person or persons; and shall, only upon warrants issued therefor by any officer authorized to issue the same, immediately arrest such person or persons and bring them before the proper officer, to be dealt with according to law, and shall make due return of said warrant, and notify the board of his acts and doings in that behalf; and it shall be the duty of the board in every proper way to assist in the prosecution and conviction of any and all persons guilty of any of the crimes and misdemeanors against the laws of this Territory in feloniously marking or branding or stealing any stock, or other crime or misdemeanor under any of the laws of this Territory for the protection of the rights and interests of stock owners.

Accounts. SEC. 19. All accounts shall be presented to the board, accompanied with triplicate vouchers, two of which shall be filed in the office of the board; they shall be examined, considered, and approved for payment, if ascertained to be correct, and thereupon certified by the chairman, and countersigned by the secretary to the Territorial auditor, setting forth each item covered in said certificate. The Territorial auditor shall then draw his warrant on the Territorial treasurer for the respective amount set forth in each specified account, and the treasurer shall pay the same as other Territorial warrants are paid: *Provided,* That no warrant shall be issued in payment for the printing of the reports of the live-stock sanitary board.

Unclaimed funds. SEC. 20. Whenever any funds, received by the board from the sale of stock, shall have remained in its possession for twelve months without any owner thereof having been found, it shall be the duty of the chairman of the board to pay the same to the Territorial treasurer, to be by him placed to the credit of the general fund of the Territory.

Must appoint inspectors. SEC. 21. It is the duty of the board upon a petition signed by not less than twenty-five persons, each of whom shall be interested and engaged in the business of owning and breeding live stock in the Territory of Arizona, to appoint stock inspectors who shall hold their offices at the will and pleasure of the board.

Duties of inspectors. SEC. 22. It is the duty of inspectors, under rules and regulations prescribed by the board, to inspect for health and for marks and brands, at the railway loading stations, at the place of exit from the Territory, and at all places where neat cattle are gathered to be driven off their range for any purpose, or that are being driven away from their usual range, wheresoever and whensoever the inspector shall encounter them or designate, all neat cattle about to be or which are being shipped, gathered, or driven from any place in the Territory to any other place either in or out of the Territory, and to require from the owner or owners, person or persons in charge of such stock a list of the brands and marks, and to make sure by inspection that any and all live stock being shipped or driven as aforesaid is not stolen property, and that the person or persons in charge are the owners thereof, or are properly authorized in writing to handle such stock. The inspector shall make a permanent record of such inspection, showing the place and date of making the same, the name of the owner or owners, the person or persons in charge of said stock, the kind and description of stock, together with the number in each brand and mark, and all other and further necessary information, which said record shall be open for inspection by all persons desiring to inspect the same. A duplicate record of all inspections shall be sent to the board at such times and under such rules and regulations as the board may adopt. If on such inspection cattle shall be found not belonging to the shipper or to the driver, which he is not authorized in writing to ship or drive, all such cattle shall be taken by the inspector and dealt with in accordance with the rules of the board in such case made.

Oath and bond of inspectors. SEC. 23. Any person who shall receive appointment to be inspector, before entering upon the performance of his duties, shall take the oath of office prescribed by law, and shall file a bond in the sum of five hundred dollars ($500) with the county recorder of the county wherein he resides, running in the name of the Territory, executed by himself, and at least two good and sufficient sureties, which bond shall be approved by the chairman of the board of supervisors of said county, conditioned upon the faithful performance of the duties of his office.

Liability of inspectors. SEC. 24. Any inspector who shall knowingly give or make a false certificate, or shall, without good cause, refuse to give a certificate of inspection, or shall accept any bribe for failure to perform any of the duties prescribed by law, or who shall give a certificate of inspection before receiving his fees for such inspection, or wilfully delay in making inspection when notified, shall be liable with his sureties on his official bond to the injured parties for all damages arising therefrom.

Prompt inspection. SEC. 25. Every inspector must inspect all live stock subject to inspection immediately, except when such inspector is engaged elsewhere in a like duty, upon being advised or informed that the same are subject to inspection, and when inspected the one in charge thereof shall at once pay to the inspector therefor five (5) cents per head for horses and neat cattle; two (2) cents per head for hogs; whereupon the inspector shall certify in writing to the owner or person in charge, on form furnished by the board, that said stock has been inspected according to law for marks and brands.

Arrest for driving strange cattle. SEC. 26. Any person, not being the owner, or having the right of possession of any animal or animals who shall be found driving any such animal or animals off its or their usual range without the consent of the owner or owners thereof shall be deemed guilty of larceny, and shall be arrested by the inspector, or by any constable, officer, or other person specially deputized for that purpose by a judge or justice of the peace, and such person or persons shall be taken before a magistrate for examination.

Transportation before inspection illegal. SEC. 27. It shall be unlawful for any common carrier to receive any live stock for transportation until the same shall have been inspected as required herein and until such common carrier shall have been furnished with a certificate by a duly authorized inspector, showing that the brands and earmarks on such live stock have been duly inspected as required by law. Any common carrier, or any officer, agent, or servant thereof who shall violate the provisions of this section shall be deemed guilty of a misdemeanor and, on conviction thereof, shall be fined not less than one hundred dollars ($100) and not more than five thousand dollars ($5,000), in the discretion of the court.

Penalty. SEC. 28. Any person violating any of the provisions hereof shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine not exceeding three hundred dollars ($300), or by imprisonment in the county jail not exceeding six months, or by both such fine and imprisonment.

Close season for Texas fever. SEC. 29. No person shall, between the first day of February and the first day of December of any year, drive or cause to be driven into or through any county or part thereof in this Territory, or turn loose or cause to be turned upon or kept in any highway, range, common, or enclosed pasture within this Territory any cattle capable of communicating or liable to impart what is known as Texas, splenetic, or Spanish fever. Any person violating any provisions of this section shall upon conviction thereof be adjudged guilty of a misdemeanor, and shall for each offense be fined not less than one hundred dollars ($100) and not more than two thousand dollars ($2,000), or be imprisoned in the county jail not less than thirty days and not more than one year, or by both such fine and imprisonment.

Penalty for moving affected cattle. SEC. 30. No officer, agent, employee, servant, or other person connected with or employed in the business of operation of any railroad, common carrier, or other transportation company or association shall ship or cause or permit to be shipped, or transport or cause or permit to be transported by means of the transportation afforded by such common carrier, railway, or other transportation corporation, company, or association, or deliver to any consignee or other person between the first day of February and the first day of December of any year, within this Territory, any cattle capable of communicating or liable to impart what is known as Texas, splenetic, or Spanish fever. Any person connected with or employed in the business or operation of any railway, common carrier, or other transportation company, corporation, or association, violating any of the provisions of this section, shall upon conviction thereof be adjudged guilty of a misdemeanor, and shall for each offense be fined not less than five hundred dollars ($500) nor more than two thousand dollars ($2,000), or be imprisoned in the county jail not less than thirty days nor more than one year, or by both such fine and imprisonment:

Cattle passing through exempted. *Provided*, That cattle in transit in cars through this Territory on any railroad, and not unloaded, are not liable to the penalties attached to this section.

Officers may quarantine upon complaint. SEC. 31. It shall be the duty of any sheriff, undersheriff, deputy sheriff, or live-stock inspector within this Territory, upon a complaint made to him by any citizen of the Territory, or otherwise having notice or knowledge that there are within the county where such officer resides cattle believed to be capable of communicating or liable to impart the disease known as Texas, splenetic, or Spanish fever, to forthwith take charge of and restrain such cattle under such temporary quarantine regulations as will prevent the communication of such disease and make immediate report thereof to the said board, and such officer shall keep such cattle in custody as aforesaid until released by order of said board, and no officer who shall take or detain any cattle under the provisions of this statute shall be liable to the owner of such cattle for any damage by reason of such detention or taking, or by reason of the performance of any other duty enjoined by this section.

Owners must pay cost of quarantine.

SEC. 32. Whenever said board shall determine that certain cattle within the Territory are capable or liable to impart Texas, splenetic, or Spanish fever, they shall issue an order to the sheriff or any constable or live-stock inspector of the county in which such cattle are found, commanding him to take and keep such cattle in his custody, subject to such quarantine regulations as they may prescribe until the first of December next ensuing, on which date they shall direct such officer to deliver such cattle to their owners or agents: *Provided, however*, That before any cattle so held shall be delivered as aforesaid there shall be paid to said board all the costs and expenses of taking, detaining, and holding said cattle, and in case such costs and expenses are not paid within ten days after the first day of December, the said officer shall advertise, in the same manner as is by law provided in cases of sales of personal property, that he will sell such cattle or such portion thereof as may be necessary to pay such costs and expenses of the sale, and at the time and place so advertised, he shall proceed to sell as many of said cattle as shall be necessary to pay off said costs and expenses and expenses of the sale, and forthwith shall pay over to the owner of said cattle or his legal representative any amount so received in excess of the legal fees and expenses of such officer. Any officer performing any of the duties enjoined in this section or in the next shall receive the same compensation therefor as is prescribed by laws for similar services, to be paid as other expenses of said board are paid by law.

Violators of law liable for damage done.

SEC. 33. Any person, such as is specified in section 29 of this title, or any officer, agent, employee, servant, or other person as is specified in section 30 of this title, violating any of the provisions hereof, shall be liable to any party injured, through such violation for any damage that may thereby arise, from the communication of Texas, splenetic, or Spanish fever, to be recovered in a civil action, and the party so injured shall have a lien for his damages on the cattle so communicating the disease, such lien to be enforced in like manner as other liens are enforced.

Butchers and slaughterhouses.

SEC. 34. Any person or persons, firm, or corporation engaged in the slaughter of live stock for sale in this Territory shall slaughter all such animals in a fixed and definite slaughterhouse or slaughter pen, to be kept by such person or persons for that purpose; and before such person, persons, firm, or corporation shall begin, enter upon, or carry on the business of slaughtering any neat or horned cattle, swine, sheep, or goats for sale, or for the sale of meat, or selling or exposing for sale the meat of such animals in the Territory of Arizona, such person, persons, firm, or corporation shall first procure from the live-stock sanitary board a license to operate such slaughtering business, and to sell or expose for sale such meat, under the conditions and upon the payment of the fees herein provided; and after procuring such license, and before engaging in such business, such person or persons shall execute upon a blank form furnished by the board a bond, with two or more good and sufficient sureties, to the Territory of Arizona, in the penal sum of one thousand dollars ($1,000), to be approved by the chairman of the board of supervisors of the county in which such business is to be carried on, conditional that such person, persons, firm, or corporation shall not slaughter or expose for sale any neat animal, or the meat thereof, without first being the legal and equitable owner thereof as well in law as in fact, and that in case such person, persons, firm, or corporation shall slaughter or sell, or expose for sale, any neat animal or the meat thereof as aforesaid shall pay therefor double the value of any such animal, the same to be recovered by action on said bond in the name of the true owner of such animal. The amount so recovered shall be paid as follows: One-half to the owner of such animal, one-fourth to the inspector or person discovering the wrongful possession or slaughtering of such animal, and the remaining one-fourth to the license and inspection fund hereinafter provided for, and on the compliance with all the provisions of this title applying to butchers.

Butcher license.

SEC. 35. The live-stock sanitary board shall grant to each and every applicant therefor, upon the payment of the fees herein provided, a license to slaughter horned and neat cattle, swine, sheep, and goats as may be set forth in such application for the term of one year from the date such license is granted. If the business is to be carried on within, or within four miles of, any town of more than five thousand inhabitants the applicant shall pay to the board the sum of one hundred and fifty dollars ($150) for a license to operate such business of slaughtering, at a fixed and definite slaughtering place; in case the business is to be carried on within, or within four miles of, any town or village of more than three thousand and less than five thousand inhabitants, the applicant shall pay one hundred and twenty dollars ($120) for such slaughtering license; in case the business is to be carried on within, or within four miles of, any town or village of over one thousand and less than three thousand inhabitants, the applicant shall pay ninety dollars ($90) for such slaughtering license; and in all other cases thirty dollars ($30) for such slaughtering license.

License is for one place only. SEC. 36. Each and every license issued under this title shall be for one specific place of business, and the location of the place of business for which it is issued shall be stated therein.

Application in writing. SEC. 37. The applicant for such license shall make written application to the board therefor and state in his application where his slaughterhouse is or will be located during the term for which such license is issued, and he shall not, during the term for which such license is issued, slaughter any neat or horned cattle, swine, sheep, or goats at any other place than that specified in his license.

Transfer of license. *Provided*, That if for any reason, the holder of a license desires to change any such slaughtering place he shall apply to the said board to have such license transferred to cover such change. And said board shall reissue such license on application therefor without any additional charge for the unexpired term of such license.

Definition of butcher. *Provided*, That any person, firm, or corporation who shall kill more than two head of horned or neat cattle for sale or for the sale of meat in any one month, or who shall kill more than six head of hogs, sheep, or goats for sale or for the sale of meat in any one month, shall be considered butchers within the meaning of this title.

Imparting Texas fever. SEC. 38. In the trial of any person charged with a violation of any of the provisions hereof, and in the trial of any civil action to recover damages for the communication of Texas, splenetic, or Spanish fever, proof that the cattle which such person charged with driving or keeping in violation of law, or which are claimed to have communicated the said disease were brought into this Territory between the first of February and the first of December of each year in which the offense was committed or such cause of action arose, from territory within the area of which the United States Department of Agriculture from time to time has given notice that a contagious and infectious disease known as splenetic, or Southern, fever exists among cattle, shall be taken as prima facie evidence that such cattle were capable of communicating or liable to impart Texas, splenetic, or Spanish fever within the meaning of this title, and that the owner or person in charge of such cattle had full knowledge and notice thereof at the time of the commission of the alleged offense: *Provided*, That the provisions hereof shall apply to the State of California during the whole year, and shall not apply to any cattle shipped or driven from Sonora, Mexico.

Joint liability. SEC. 39. Whenever two or more persons shall, in violation of this title, at the same time, or at different times during the year, drive or cause to be driven, upon any highway, range, common, or pasture within this Territory, any cattle capable of communicating or liable to impart said fever, they shall be jointly and severally liable for all damage that may arise from the communication of such disease at any time thereafter during the same year, to any domestic, native, or acclimated cattle, that have been on the same highway, range, common, or pasture, so previously traveled over by such mentioned cattle.

Evidence of theft. SEC. 40. In the trial of any criminal suit in which the accused is charged with stealing any neat animal or animals, evidence that the accused has stolen other neat animal shall be heard if offered, provided the other offenses so follow each other, when taken in connection with the facts and circumstances pertinent to each case, as to show a purpose of engaging in and continuing the work of stealing neat cattle.

Inspectors appointed on petition. SEC. 41. The said board, on petition therefor, signed by at least twenty-five persons, each of whom are engaged in the business of owning and breeding live stock in this Territory, shall have power to and shall appoint live-stock inspectors to reside in or near each city, town, or village, or at any point where live stock is slaughtered in this Territory, who shall hold office at the will and pleasure of the board. No person or persons engaged or employed in the butchering business shall be eligible to hold the office of inspector.

Butchers must give location of slaughterhouse. SEC. 42. It shall be the duty of any person, persons, or firm, or corporation, carrying on the business of slaughtering said animals, to notify the nearest inspector appointed under this title, of the location of his or their slaughterhouse or slaughter pen, and of the time or times when such person or persons propose to slaughter any such animals, and no animal shall be slaughtered by any person until it shall have been first inspected and certified to as being the property of the one slaughtering it or causing it to be slaughtered, or that such person is authorized to slaughter. The board shall prepare these certificates in blank, and a copy of each certificate given shall be kept in a book by the inspector, which book shall at all times be open to inspection and examination of all persons wishing to inspect or examine it. Upon said animals so inspected and certified to being butchered, then the inspector shall inspect the hide, and if he shall find it to be the hide of the animal so inspected and certified to, then he shall tag the same on the left side of the neck with a tag seal to be furnished him by the board.

Inspection fee. For each animal and hide so inspected the butcher shall pay the inspector five (5) cents at the time the hide is inspected and before it is tagged, which shall be full payment for inspecting the live animal and inspecting and tagging the hide.

Inspections, and evading same. SEC. 43. A duplicate record of all inspections shall be sent to the board, and triplicate given to the butcher at such times and under such rules and regulations as the board may adopt. Any person, persons, firm, or corporation selling, removing, or secreting any hide or hides or detaching, obliterating, or defacing from or upon the hide any mark or brand before they are inspected and tagged shall be guilty of a misdemeanor and shall be punished as hereinafter provided.

Meat can not be sold before hide inspected. SEC. 44. Any ranchman, trader, or any other person not regularly engaged in carrying on the business of slaughtering neat cattle at some known and established slaughter place within four miles of some city, town, or village within the limits of this Territory who shall slaughter any neat or horned cattle for sale or for food, on their ranches or elsewhere, shall, before offering the meat for sale in any city, town, or village within the limits of this Territory, take the hide thereof to a regularly appointed inspector and shall have it inspected and tagged, immediately paying therefor five (5) cents for each hide inspected and tagged. All persons not engaged as butchers who shall at any time kill or slaughter or cause to be killed or slaughtered any cattle, either for his or their own use and consumption or for sale, shall retain or cause to be retained in his or their possession the hides taken off such animal or animals, with the earmarks attached thereto, without any alteration or disfiguration of the brands or marks on said hide or ears, for the period of twenty-one days, free to the inspection of all persons, and before shipping the same shall cause it to be inspected and tagged; and any person failing to keep the hides in the manner and for the time above mentioned, or shall refuse to any person the inspection of such hide or hides, shall be guilty of a misdemeanor, and upon conviction shall be fined in any sum not exceeding two hundred dollars ($200): *Provided*, That anyone may immediately sell or otherwise dispose of the hide of any animal as soon as it is duly inspected and tagged by an authorized inspector.

License-inspection fund. SEC. 45. All moneys received by the board for the licenses provided for in this title shall be turned over to the Territorial treasurer to be deposited in a special fund, to be known as the "License and inspection fund," and such fund shall be subject only to warrants drawn by the Territorial auditor on demand of the chairman of the live-stock sanitary board, duly countersigned by the secretary, for the payment of slaughterhouse inspectors: *Provided*, That no slaughterhouse inspector shall receive less than fifty per cent or more than ninety per cent per annum of all such license fees paid from or within his district, such payments to be made quarterly, and any and all balance remaining in each fund after paying such warrants shall, at the end of each fiscal year, be turned over to the general fund of the Territory, on demand of said board.

Untagged hides must not be purchased. SEC. 46. It shall be unlawful for any trader or other person to purchase or otherwise acquire possession of any hide of horned or neat cattle until the same shall have been inspected and tagged as required by the provisions of this title, and the possession of such untagged hide shall be considered prima facie evidence of the commission of a misdemeanor, unless the person possessing such hide can show that the same was taken from an animal owned by him at the time of slaughter or death, or that he had written authority from the owner to remove the hide from such animal.

Butchers must send in monthly record. SEC. 47. Any person who shall set up or carry on the business of butchering or slaughtering of horned cattle or swine in this Territory shall keep a true and faithful record, in a book to be kept for that purpose, of all live stock purchased or slaughtered by him, with a description of all animals so purchased or slaughtered, including all the marks and brands of such animals, the name and residence of the person from whom purchased, and the date of such purchase; and shall at the end of each month make a true and correct copy of such record so required to be kept by this section, under oath, and deliver the same to the inspector of his district.

Penalty. Any such person, persons, firm, or corporation who fails to keep such record, or who fails or neglects to deliver a true copy of the record mentioned in this section, or who refuses to exhibit to any person demanding it the said record, is guilty of a misdemeanor, and shall be fined a sum not less than fifty dollars ($50) nor more than one hundred dollars ($100) for every day he shall have failed to comply with this section.

Untagged hides can not be transported. SEC. 48. It shall be unlawful for any person or common carrier to receive for transportation any hides until the same shall have been inspected and tagged as provided in this title.

Penalty. Any person, common carrier, or officer, agent, or servant of a common carrier who shall violate the provisions of this section shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not less than one hundred dollars ($100) and not more than five hundred dollars ($500), in the discretion of the court.

Marks and brands. SEC. 49. Every person, firm, company, or corporation owning range horses, mules, asses, or neat cattle in this Territory shall have a mark or brand for them by which they shall be marked and branded; and every person owning range sheep or goats in this Territory shall have an earmark for them different from his neighbors' and as near as practicable different from any other earmark in the Territory, by which they shall be earmarked, and the same may be identified and shall be prima facie evidence of ownership, but only from and after the time herein provided; and when such mark and brand or earmark shall have been so recorded it shall be the personal property of the person causing it to be recorded, and may be sold and encumbered the same as other property, except that no range animal can be sold except by bill of sale duly made, signed, and acknowledged as deeds conveying real estate are acknowledged: *Provided*, That any earmarks or brands for sheep or goats which have heretofore been recorded in the office of the live-stock sanitary board, together with the record thereof, are hereby legalized and validated.

Records of marks and brands. SEC. 50. Said board shall record all such marks and brands as may be adopted by the owners of range animals in a book by it kept for that purpose: *Provided*, That the mark or brand so adopted has not theretofore been adopted and recorded by some other person: *And provided further*, That the mark and brand so adopted shall not conflict with the mark or brand of some other person owning range animals running in the brand and who has a prior right thereto.

Fees for recording. SEC. 51. All marks and brands not now recorded in the brand book of said board may be so recorded on the persons owning the same and having the right thereto sending to said board a facsimile copy thereof, proof that he is or they are the true and sole owner thereof, and that he is then the owner of range animals running in said brand, and inclosing therewith one dollar ($1) wherewith to pay for recording the same, and one dollar ($1) for a certificate thereof if recorded, and if not recorded, then the amount paid for the certificate shall at once be returned.

Certificate of record. SEC. 52. So soon as such brand and mark shall have been considered and passed by the board for record, then the board shall issue its certificate thereof, wherein shall be shown the name of the owner thereof, his post-office address, the place where his animals range, the date of the record thereof, and a facsimile of such brand and mark, to be signed by the chairman of the board, attested by its secretary with the seal of the board affixed; and such certificate shall be prima facie evidence in all the courts of this Territory of the matters therein contained.

Brand book. SEC. 53. The board shall deliver to each inspector and to each county recorder's office in this Territory a true printed copy of the brand book and of all supplements thereof. Each of these shall be certified to by the chairman of the board, attested to by the secretary, and its seal affixed. The certificate shall state that it is a true, full, and correct copy of the brand book, and contains a facsimile of each and every mark and brand recorded, with its owner's name, his post-office address, and his range, opposite the mark and brand. Said printed copy of said brand book, and of all supplements thereto that are so certified to, shall be in all the courts in this Territory prima facie evidence of the truth of the matters therein contained; and the board may in its discretion deliver to any person engaged in the business of breeding range cattle certified copies of the brand book and of all the supplements thereto, on the payment to the board of such fair and reasonable price as to the board may seem just; and such books, when so certified and delivered, shall be received in evidence with like effect as to those delivered to inspectors and county recorders.

Ownership of animals. SEC. 54. The ownership of animals may be shown by the mark or brand on the animal, if marked or branded, by proof of the ownership of the mother of the animal sought to be identified and ownership of which is sought to be established, and by any person or persons who may know the animal and its owner, independent of any mark, brand, or its paternity.

Rights of prosecution. SEC. 55. In the trial of any person charged with the violation of any of the stock laws of this Territory, the prosecution shall have the right to prove, as tending to show conversion by the accused, that the animal or animals in question were branded into a brand or were marked into a mark claimed by the accused to be his brand or mark, although such brand or mark is neither of them recorded, and in all cases where any live stock, the property of a resident of a foreign country, are alleged to have been stolen and are held in this Territory, which live stock so alleged to have been stolen have either strayed or have been driven from a foreign country into this Territory, the ownership thereof may be shown by the marks or brands thereon, although such marks or brands shall not have been recorded, and in every such case the question whether any such live stock were stolen in a foreign country and were driven into this Territory, or strayed into this Territory and were then stolen in this Territory, shall be immaterial, in all cases where the allegation of the indictment is that they were stolen in the county where the indictment is found.

Words defined. SEC. 56. In all pleadings, whether civil or criminal, the words neat animal shall be held to include all kinds, ages, and sexes of the bovine species; the word horse shall be held to include all kinds, ages, and sexes of the horse species, and the word mule, all ages, kinds, and sexes of the mule kind.

Bills of sale. SEC. 57. Upon the sale, alienation, or transfer of any horses, mules, asses, or neat cattle by any person in this Territory, the actual delivery of such animals shall be accompanied by a written bill of sale from the vendor or the party selling to the party purchasing, giving the number, kind, marks, and brand of each animal sold and delivered, which bill of sale shall be signed by the party giving the same, and shall be acknowledged by him as his act and deed before some officer authorized under the laws of the Territory to take acknowledgment of deeds of conveyance; and upon the trial of any person charged with the theft, unlawful possession, handling, driving, or killing of any such animal as is mentioned in this section, under any law of this Territory, the possession of such animal by the accused, under any law of this Territory, without his having a duly written and acknowledged bill of sale therefor, such as is required by the provisions of this section, shall be prima facie evidence against the accused that such possession was illegal; and no officer acknowledging any bill of sale or other written instrument required to be acknowledged under the provisions hereof shall be authorized to exact or receive a larger fee than twenty-five (25) cents for acknowledging, certifying to, and affixing his seal to such instrument.

Vent or counter-brand. SEC. 58. Upon the demand of the purchaser, every person who sells horses, mules, asses, or neat cattle must vent or counter-brand such animals, and said vent or counter-brand must be upon the same side of the animal as the original brand. A legal vent shall be a stamp iron, and before used it must first be recorded with the county recorder of the county where the cattle are ranged: *Provided*, That animals sold to be slaughtered or shipped out of the Territory need not be vented.

Brands not recorded. SEC. 59. Whenever any live stock branded with any brand not duly recorded as required by the provisions of this title shall be found at large upon any range in this Territory, the same shall be reported to the said board by any duly authorized inspector and detective therefor, and shall be considered as unclaimed live stock and shall be disposed of as now provided by law for the disposition of unclaimed live stock.

Written authority to handle live stock. SEC. 60. Any person, company, or corporation owning a recorded mark or brand, and being the owner or owners of animals of the horse, mule, ass, or neat-cattle kind, branded with such recorded brand, or who shall be the lawful owner of such animals having other brands, who may wish to authorize any other person or persons to gather, drive, or otherwise handle any of said animals by their mark and brand, shall furnish to such person or persons an authority in writing, containing the list of the marks and brands authorized to be handled, and authorizing the person or persons therein named to gather, drive, or otherwise handle the stock therein described, and the possession of such written authority shall be deemed sufficient to authorize the person or persons therein named to gather, drive, or otherwise handle any of such animals in the marks and brands set forth and described in the said written authority: *Provided*, That if any person, firm, company, or corporation, in giving any such written authority as is provided in this section, shall insert therein any mark or brand of which said person, firm, company, or corporation is not the lawful owner, and any animal having any such mark or brand shall be unlawfully taken, gathered, driven, or otherwise unlawfully handled by the person or persons having such written authority and by virtue thereof, then the person, firm, company, or corporation giving such written authority shall be deemed principals to the unlawful taking, gathering, driving, or handling of such animal or animals.

Sale of range cattle. SEC. 61. The owner or owners of horses, mules, asses, or neat cattle running at large upon any range in this Territory may dispose of such animals by range delivery while on the range and ungathered by the sale and delivery of the marks and brands of such animals; but in every such case the purchaser, in order to acquire title to such animals, must have his conveyance or written transfer of such animals described by marks and brands duly acknowledged by the vendor and then recorded in the office of the county recorder of the county in which such animals range, in a book kept for such purpose, and such sale or transfer shall be noted on the record of original marks and brands in the office of said board.

Unlawful branding. SEC. 62. Any person who shall mark or brand any unmarked or unbranded horse, mule, ass, or neat cattle found running at large upon any range in this Territory with a mark or brand that has not been recorded under the provisions of this title, or who, for the purpose of branding horses or cattle, uses as a brand a sash, frying pan, or any device whatsoever which can be employed or used to obliterate a brand, and every person who shall use any unrecorded brand which is an infringement upon any recorded brand, or who shall use a like brand in the same position or place recorded by another, shall be deemed guilty of larceny of said animal.

Using animals without consent. SEC. 63. Hereafter it shall be unlawful for any person to take up from any range, ranch, farm, corral, yard, or stable any horse, mule, or other animal and use the same without the consent of the owner of any such animal or of the person having the same in charge.

Taxes on live stock. SEC. 64. Live stock so branded shall be listed for assessment, and taxes assessed against the same shall be collected in the same manner as is provided for the assessment and collection of taxes upon real estate; and such assessment shall constitute a lien for taxes on all the stock in that brand: *Provided*, That if the owner of any brand shall sell any number of cattle less than the entire number under any brand before the taxes are due, such owner shall be permitted to pay taxes on the number sold proportioned to the number assessed in any such brand, and the amount shall be credited on the amount due under the assessment against any such brand.

Stock killed by locomotives. SEC. 65. In all cases where the live stock of any person is injured or killed by locomotive or cars on any portion of the line of any railroad company within this Territory unfenced by good and sufficient fence, or other barriers sufficient to turn live stock, the company or corporation running such locomotive or cars shall be liable in damages therefor to the owner of such live stock, to be recovered in any court of competent jurisdiction within this Territory, unless it be shown on the trial of any action instituted for the recovery of such damages that the owner of such live stock, his agent or servants, immediately contributed to such killing or injury. The mere straying of live stock upon unfenced portions of such railroad shall not be held upon the trial of causes brought under this title to be any evidence of contributory negligence on the part of the owner of such live stock, nor shall the grazing of the same unattended by a herder be so considered.

Liability of railroads. SEC. 66. Every railroad corporation or company operating any railroad or branch thereof within the limits of this Territory which negligently injures or kills any horse, mare, gelding, filly, jack, jennie, or mule, or any cow, heifer, bull, ox, steer, or calf, or any other domestic animal, by running any engine or engines, car or cars, over or against any such animal, shall be liable to the owner of such animal for the damages sustained by such owner by reason thereof. The killing or injury shall be prima facie evidence of negligence on the part of such corporation or company.

Driving stock on railroads. SEC. 67. If the owner or owners, or his or their duly authorized agent or agents, of any animal or animals heretofore mentioned shall drive the same upon the track of any such corporation, association, company, person, or persons, with the intent to thereby injure it or them, and such animal or animals shall be killed or injured, such owner or owners shall be liable for all injury or damage occasioned by reason of such act, and shall be punished as provided in the penal code for felony.

Railroads to keep list of stock injured. SEC. 68. Hereafter it shall be the duty of all railroads in this Territory to require all section foremen, while in their employ and service as such, to keep at the section house a specific record, upon forms furnished by said board, of all stock killed or crippled upon their respective sections of such railroad, giving age, color, sex, marks, and brands of all such stock so killed or crippled, which record shall be open and free for inspection by the public at all reasonable times.

Railroad crossings. SEC. 69. Any railroad corporation or lessee, person, company, or corporation operating any railroad in this Territory which may hereafter fence their right of way shall make crossings through their fence and over their roadbed along their right of way at least every five miles thereof, or as near thereat as may be practicable.

Width of crossings. SEC. 70. Such opening shall not be less than sixty feet in width. The said railroad company or lessee, person, corporation, or company operating any railroad shall place cattle guards and wing fences on either side of the said openings sufficient to prevent any cattle entering upon the said right of way so enclosed.

Places unfenced. SEC. 71. Such railroad company, lessee, person, or corporation operating any railroad shall leave unfenced any places wherein the said railroad runs over any trestles or bridges that are sufficiently high for cattle to go under the same.

Penalty. SEC. 72. Any railroad company, lessee, person, or corporation operating any railroad in this Territory violating any of the provisions of the seven preceding sections shall be deemed guilty of a misdemeanor, and upon conviction thereof shall, in any court of competent jurisdiction, be fined in a sum of not less than one hundred dollars ($100) and not more than three hundred dollars ($300).

Inspections must be by daylight. SEC. 73. All inspections of live stock made by inspectors shall be made in daylight, and the inspection of horses, mules, asses, and cattle shall be made, when pens will admit, by driving such animals into a pen or corral in bunches of not more than five, and held in such pen or corral until the inspector shall personally see and inspect each and every mark and brand and mark the same on his record or tally, and when he has so inspected and tallied such cattle and is satisfied as to the same he shall order them driven out and another bunch driven in such pen or corral in like manner, and so on until the entire herd is inspected, but if there are no pens convenient to the animals to be inspected, then it shall be done in such way as the inspector shall direct.

Penalty for hindering inspector. SEC. 74. Any inspector who shall inspect cattle in any other manner than that prescribed, or any owner, employee, or other person who shall oppose, obstruct, hinder, or attempt to obstruct or hinder, by act or suggestions, such inspection as prescribed, shall be guilty of a misdemeanor, and fined not less than fifty dollars ($50) and not more than three hundred dollars ($300), or imprisonment in the county jail not more than ninety days.

General penalty. SEC. 75. Any person violating any of the provisions of this title the penalty of which is not otherwise specially provided for shall be adjudged guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than ten dollars ($10) nor more than three hundred dollars ($300), or be imprisoned in the county jail for not less than ten days nor more than six months, or by both such fine and imprisonment, in the discretion of the court, but nothing in this title shall be construed to repeal any existing law imposing penalties for the unlawful taking, driving, killing, branding, defacing of brands, or other unlawful handling of any of the kinds of animals mentioned herein.

Criminal cases. SEC. 76. It shall be the duty of the prosecuting attorney of the proper county to prosecute on behalf of the Territory all criminal cases arising under this title.

Attorney-general. SEC. 77. It shall be the duty of the attorney-general at all times to advise with said board whenever called on, to give opinions in writing in response to requests by the said board, its agents or employees.

Took effect September 1, 1901.

SANITARY PROTECTION OF SHEEP

Sheep inspector. SECTION 1. The board of supervisors of any county in this Territory, upon the presentation of a petition signed by not less than fifteen residents of such county, each of whom shall be the owner of not less than two thousand sheep in such county, engaged in the business of sheep breeding and wool growing in this Territory, shall appoint an inspector of sheep for such county, who shall hold his office for the term of two years and until his successor is appointed and qualified, unless sooner removed by such board of supervisors, and shall receive from such county such salary as may be agreed upon by the board of supervisors, not to exceed one hundred dollars ($100) per month.

Qualifications and bond. Such inspector of sheep shall be a resident of the county for which he is appointed, and shall be a practical sheep man. Before entering upon the discharge of his duties he shall execute a bond, payable to the Territory of Arizona, in the sum of one thousand dollars ($1,000), with at least two good and sufficient sureties, to be approved by the board of supervisors, conditioned for the faithful discharge of the duties of his office. Such inspector may appoint one or more deputies within his county, for whose official acts he and his official bond shall be responsible.

Duties. It shall be the duty of such inspector at any time, upon the written information of any citizen of his county having in charge or owning sheep, that sheep in such county owned by or in charge of any other person, giving location thereof, and infected with scabs, scabies, or other contagious or infectious disease, or upon personal knowledge of such facts, to examine such sheep without delay, and, if he shall find such sheep to be infected with any such diseases, he shall notify the owner or party in charge thereof, in writing, to doctor, dip, or cure them forthwith by the use of some standard curative medicine, and shall place such sheep in quarantine, and direct and limit the range to be occupied, and the route of travel of such sheep, until dipped and cured of such disease as directed by such inspector, and if such owner or party in charge of such sheep shall fail, neglect, or refuse to carry out the directions of such inspector, said inspector shall take such sheep into his possession at once and cure them, or cause them to be cured. He may call to his assistance such aid as may be necessary for that purpose, and the owner or owners of such sheep shall be liable to said inspector for all necessary expenses, costs, and charges incurred in curing such sheep, including a compensation of five dollars ($5) per day to such inspector or his deputy for every day or part of a day in which he shall be necessarily employed, and ten (10) cents per mile for each and every mile traveled to and from the place of quarantine or doctoring.

Infected sheep. SEC. 2. Whenever on examination of any herd or band of sheep within any county of this Territory said inspector shall find such sheep or any part of them infected by any of said diseases, he shall forthwith take all and every necessary measure and precaution to prevent such disease from spreading, and the owner or owners of such sheep shall immediately proceed to treat such sheep for the cure of such disease, and any person who shall refuse or neglect to immediately observe the directions of such inspector as provided in this section or the preceding section of this act, shall be guilty of a misdemeanor, punished on conviction by a fine of not less than one hundred dollars ($100) and not more than two hundred and fifty dollars ($250).

Inspector may prescribe dip. SEC. 3. The inspector in charge shall be empowered to prescribe the kind of dip to be used, its strength, and all the conditions and details of the dipping, doctoring, and curing of any diseased or infected sheep, and no diseased or infected band of sheep shall be released by such inspector until they are pronounced cured and clean:

Appeal to veterinarian. *Provided*, That whenever the decision of the inspector shall be denied or disputed by the owner or party in charge of the sheep, he shall be entitled to appeal to the Territorial veterinarian, who shall examine such sheep and whose decision shall be final as to such disease or infection:

Veterinarian to act where no inspector. *Provided*, That in all counties of this Territory where no inspector is appointed, as above provided, the Territorial veterinarian shall have and exercise all the powers of sheep inspector for such county or counties, and shall receive for himself and his deputy the same fees provided for inspectors in addition to his mileage as Territorial veterinarian.

Payment of fees. SEC. 4. All legal fees, charges, and expenses of such inspector, under this act, shall be a first lien upon any such diseased or infected sheep, in whosesoever possession they may be found, for thirty days after treatment, as herein provided; and in case the owner or owners, or party in charge representing such owner or owners, in their absence, shall fail or refuse to pay any legal charges, fees, mileage, or expenses, upon the completion of such inspection or treatment, as provided in this act, such inspector may recover such fees, charges, and expenses from the owner or owners of such sheep by an action in any court of competent jurisdiction, or he may seize and hold such sheep, or any part thereof, for such payment; and if such fees, charges, or expenses are not paid within ten days after such treatment is completed, then such inspector may sell, at public or private sale, sufficient of such sheep to pay all legal fees, charges, and expenses, including the expense of such seizure and holding, and five dollars ($5) per day for his time during such seizure and holding.

Times of dipping. SEC. 5. Any band or flock of sheep infected with scab or scabies shall be dipped as often as necessary, and until they are pronounced clean by the inspector; but no sheep shall be required to be dipped, at such season of the year, or during such inclement weather, or so short a time before or after lambing, or under any such conditions or circumstances that would endanger the health or lives of such sheep, but diseased or infected sheep which can not for any reason be dipped at once must be held and run under the quarantine regulations of the inspector until such time as they may be safely dipped, and any sheep so held and run shall be so restrained and quarantined as to incur the least practicable damage to the sheep and expense of [or] hardship to the owner, and the fee of five dollars ($5) per day shall not in any case be charged by the inspector so long as the owner or party in charge shall comply with all reasonable regulations of the inspector.

Inspector must use diligence. SEC. 6. It shall be the duty of each inspector appointed as aforesaid to use diligence in ascertaining the existence of scab or scabies or other contagious or infectious disease among the sheep of his county, and to inspect from time to time all sheep within his county, and see that the spirit and intent of the law is enforced; and any inspector or deputy inspector who shall fail or neglect to faithfully perform the duties of such office shall be guilty of a misdemeanor and subject to a fine not to exceed one hundred dollars ($100).

Took effect May 1, 1901.

ARKANSAS.

AN ACT To amend the act establishing a district quarantine line in the State of Arkansas.

Be it enacted by the General Assembly of the State of Arkansas:

Time when line is open. SECTION 1. That section two of an act entitled "An act to locate and establish a district cattle quarantine line in the State of Arkansas," approved March 19, 1899, be amended to read as follows: Said line shall be open to the free and unrestricted transfer of cattle, by driving or otherwise, across said line from and after the fifteenth day of November of each year, and shall continue open until the first day of March the succeeding year, after which date it shall be unlawful to drive or transport any and all cattle across said line:

Cattle passing through exempt. *Provided,* That this act shall not interfere with the shipment of cattle by cars which are being transported across the State to other markets or places of destination outside of the State or Territory included in said quarantine district.

Repealing clause. SEC. 2. That all laws and parts of laws in conflict with this act be, and the same are hereby, repealed, and that this act shall take effect and be in force from and after its passage.

Approved February 16, 1901.

AN ACT To amend an act entitled "An act to locate and establish a district cattle quarantine line in the State of Arkansas," approved March 9, 1899.

Be it enacted by the General Assembly of the State of Arkansas:

New quarantine line. SECTION 1. That section 1 of an act to locate and establish a district cattle quarantine line in the State of Arkansas, approved March 9, 1899, be amended so as to read as follows:

"That there shall be established by the State of Arkansas a district cattle quarantine line, described as follows: Beginning at the northwest corner of Benton County and running thence south along the boundary line of this State to the southwest corner of Washington County; thence in an easterly direction following the southern boundary lines of Washington, Madison, Newton, Searcy, and Stone counties to the northwest corner of Cleburne County; thence south along the line between Cleburne and Independence counties to the southwest corner of Independence County; thence east along the southern boundary of Independence County to the west boundary of Jackson County; thence north along the line between Jackson and Independence counties to the Lawrence County line; thence east along the southern boundary of Lawrence County to the southeast corner of Lawrence County; thence north along the eastern boundary of Lawrence County to the southern boundary of Greene County; thence east along the southern boundary of Greene County to the Missouri line."

Repealing clause. SEC. 2. That all laws and parts of laws in conflict herewith be, and the same are hereby, repealed, and that this act take effect and be in force from and after its passage.

Approved March 22, 1901.

IDAHO.

AN ACT To prevent the spread of infectious or contagious diseases, providing for the disposition of animals dying therefrom, and fixing a penalty for failure to comply therewith.

Be it enacted by the Legislature of the State of Idaho:

Destruction of diseased carcasses. SECTION 1. It shall be the duty of any person or persons, company, or corporation, owning any hog, cattle, horse, or other domestic animal, which dies from any infectious or contagious disease, to cremate, or cause to be cremated, bury, or cause to be buried, at a depth of not less than three feet, the carcass of said dead animal, within twelve hours after the owner of said animal has knowledge of the death thereof.

Penalty. SEC. 2. Any person or persons, company, or corporation, violating any of the provisions of section 1 of this act shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than twenty-five dollars ($25) nor more than three hundred dollars ($300); and for every twelve hours after the owner of said animal has knowledge of the death thereof shall be declared a distinct and separate offense.

Carcasses on public highway. It shall be the duty of the road supervisor to remove any dead animal from the public highways whose owners are unknown, and dispose of the same in the manner provided by this act.

Repealing clause. SEC. 3. All acts and parts of acts in conflict herewith are hereby repealed.

Emergency. SEC. 4. Whereas an emergency exists, this act shall take effect and be in force from and after its passage and approval.

Approved March 11, 1901.

AN ACT Establishing quarantine against diseased sheep, prescribing the duties of the governor and State sheep inspector in relation thereto, and providing penalties for the infraction of its provisions.

Be it enacted by the Legislature of the State of Idaho:

Governor to prohibit importation. SECTION 1. Whenever the governor of the State of Idaho has reason to believe that scab or any other infectious disease of sheep has become epidemic in certain localities in any other State or Territory, or that conditions exist that render sheep likely to convey disease, he must thereupon by proclamation designate such localities and prohibit the importation from them of any sheep into the State, except under such restrictions as, after consultation with the State sheep inspector, he may deem proper.

Penalty. Any person or corporation who, after publication of such proclamation, receives in charge any such sheep from any of the prohibited districts, and transports, conveys, or drives the same to and within the limits of any of the counties of this State, is punishable by fine not exceeding one thousand dollars ($1,000) nor less than two hundred dollars ($200), and is liable for all damages that may be sustained by any person by reason of the importation or transportation of such prohibited sheep.

Inspectors to enforce quarantine laws. SEC. 2. Whenever the proclamation of the governor, issued as hereinbefore provided, shall prohibit the driving or importation of sheep into this State from another State or Territory, or subdivisions thereof, it shall be the duty of the State sheep inspector, or any of his deputies, to drive or transport said sheep so coming into this State, in violation of said proclamation, back across the State line from which they came, using all necessary force in so doing: *Provided*, That the State sheep inspector, or his deputies, may employ such assistance as may be necessary for the enforcement of the provisions of this act; and the costs of such deportation shall be a lien upon said sheep: *Provided*, That if the fine and costs in this act provided shall not be immediately paid, the deputy sheep inspector shall retain a sufficient number of said sheep to pay such fine and costs, which sheep shall be sold to pay the same, by the deputy sheep inspector, in the same manner as provided by law for the sale of personal property to satisfy a judgment; and for such services the deputy sheep inspector shall receive and retain such fees as are allowed sheriffs for like services, to be taxed as costs.

Refusal to assist. SEC. 3. Any person failing or refusing to assist such deputy sheep inspector, as in the preceding section provided, shall be punished as in section 6517 of the Revised Statutes of Idaho (1887) made and provided.

Emergency. SEC. 4. Whereas an emergency exists therefor, this act shall be in force and effect from and after its passage and approval.

Approved, March 1, 1901.

AN ACT To suppress contagious and infectious diseases of sheep, to create the office of sheep inspector and deputy State sheep inspectors, to provide for the appointment of the same, and to fix their compensation, making the doing of certain acts a crime and providing for the punishment of the same, and for other purposes, and repealing an act entitled "An act to suppress contagious and infectious diseases of sheep, to create the office of State sheep inspector and of deputy sheep inspectors, to provide for the appointment of the same and fix their compensation, making the doing of certain acts a crime and providing for the punishment of the same, and for other purposes," approved February 25, 1899.

Be it enacted by the Legislature of the State of Idaho:

Governor to appoint sheep inspector. SECTION 1. The office of sheep inspector for the State of Idaho is hereby created. It shall be the duty of the governor, within twenty-five days from and after the passage of this act, to appoint some suitable, capable, and discreet person and practical sheep grower to fill said office.

Salary and duties of inspector. SEC. 2. The said sheep inspector shall receive as full compensation for his services a salary of twelve hundred dollars ($1,200) per annum, to be paid as the salary and fees of other State officers are paid. It shall be the duty of the State sheep inspector to have general supervision over his deputies appointed under the provisions of this act, and to aid, counsel, and advise with such deputies, and generally to enforce the provisions of this act. The said sheep inspector shall have the same power within the entire State as the deputies appointed by him have in their respective districts, and where the services of the State sheep inspector are demanded in a county or district other than that in which he resides, to settle differences between sheep men and any deputy, it shall be the duty of said State sheep inspector to go and adjust such differences, and the said party or parties demanding such services shall pay the actual traveling expenses of said State sheep inspector.

Term of office and bond. SEC. 3. Said State sheep inspector shall hold his office for the term of two years, and until his successor is appointed and qualified, unless sooner removed by the governor. Before entering upon the discharge of his duties as such officer he shall file an official bond in the sum of five thousand dollars ($5,000), conditioned for the faithful performance of the duties of his office, in form and manner as other official bonds of State officers.

Deputy inspectors. SEC. 4. Such State sheep inspector shall have power, and it shall be his duty, to divide each county or counties into districts and to appoint for such districts one or more deputy inspectors, as in his judgment may seem necessary. Such deputies shall hold office until their successors are appointed and qualified, unless sooner removed by the State sheep inspector. They shall be practical sheep men, who, before entering into the duties of their office, shall take an oath of office as required of county officers, and shall give a bond to the State of Idaho in the penal sum of five thousand dollars ($5,000), conditioned for the faithful performance of the duties of such deputy sheep inspector, such bond to be approved by the State sheep inpector and be placed on file in his office. Such deputy shall be subject to removal by the State sheep inspector when, in his judgment, it shall seem necessary.

"Inspection lines." SEC. 5. It shall be the further duty of the State sheep inspector, with the assistance of the deputies appointed by him in the several districts, to create what shall be known as "inspection lines" in each county or district where it shall be deemed necessary between the summer and winter ranges, and shall cause a notice, containing a careful description of said "inspection line" in each district, to be published for three weeks in some newspaper published in said district, and upon the last publication thereof due notice of the location of such "inspection line" shall be deemed to have been given. The expense of such publication shall be a charge against the county where such notice is given, payable as other charges: *Provided*, That this section shall not be so construed as to prohibit other stock crossing said inspection lines and occupying the range inclosed by said lines.

Sheep must not cross line without inspection. SEC. 6. It shall be unlawful for any person, persons, company, or corporation owning, controlling, or managing any band or herd of sheep [to drive or herd] or cause to be driven or herded across such line going to or returning from the summer range without first having his or their sheep inspected, and obtaining the sheep inspector's certificate showing such sheep to be sound and free from scab.

Penalty. Any person, persons, company, or corporation violating this section shall be guilty of a misdemeanor, and shall be, upon conviction, punished by fine of two hundred and fifty dollars ($250), and such fine shall constitute a first lien upon said sheep so driven or herded, and shall be collected as provided for in section 14 of this act.

Inspectors may administer oaths. SEC. 7. The State sheep inspector and his deputies, appointed under this act, shall have the power to administer oaths so far as the same may be necessary in the proper performance of their duties, and any person who shall, contrary to said oath, state as true any material thing which he knows to be false is guilty of perjury.

Examinations and certificates. SEC. 8. It shall be the duty of at least one deputy inspector in each county or district, to be designated by the State sheep inspector, to personally examine all sheep and bands of sheep in his county or district between the first day of March and the first day of June of each year, and again between the first day of September and the first day of November of each year; and the State sheep inspector may, at any time he deems necessary, order an inspection in any county or district; and to the owners and persons in charge of herds found to be clean, the deputy shall issue a certificate stating such fact, which certificate shall permit such herds to pass into and through any and all counties in this State so long as they shall remain clean and free from disease; such deputy is required to examine any band or bands of sheep at any time that he may be called upon to do so at the request of one or more sheep growers, in writing, stating that such sheep are affected or infected with some infectious or contagious disease, and that there is imminent and immediate danger of the spread of such disease: *Provided*, That upon examination such sheep are found to be clean, the person or persons making such complaint shall pay the expenses of such examination, which may be recovered in a civil action therefor; but in case such inspector, upon making such examination, finds said sheep diseased, he shall forthwith issue his order quarantining said sheep, and they shall be dealt with as provided in section 9 hereof.

Diseased sheep to be quarantined and dipped.

SEC. 9. Whenever, upon an examination of any bands or herds of sheep kept or herded in any county of the State of Idaho, the deputy sheep inspector of such county or district thereof shall find such sheep, or any portion of them, affected or infected with the scab or scabies, or any other infectious or contagious disease, the entire band or herd shall be considered as infected and treated as such, and he shall immediately quarantine the same and forthwith notify the owner or person in charge of said sheep, in writing, to dip said sheep twice for said disease within the period of thirty days from said notice; the first dipping not to exceed fifteen days from the receipt of said notice and the second dipping to be within the period of from eight or twelve days from the first dipping, and also during such period to keep such sheep free from contact with other sheep by such means as he shall specify until after the second dipping: *Provided*, That in case the owner or controller of any sheep which, on account of their condition, or by reason of the inclemency of the weather, shall, in the opinion of such owner or controller, be unfit or unsafe to dip, such deputy inspector may authorize such owner or controller to place such sheep in a corral, field, or feed yard, where said sheep shall be kept from contact with other sheep until such time as they are in condition to dip. Such owner or controller shall be responsible for any and all damages which may be incurred by reason of such sheep coming in contact with sound sheep. Any person or persons so allowed to keep his sheep in such corral, field, or feed yard, who shall wilfully or knowingly take, or permit to be taken, any such sheep from such corral, field, or feed yard, except as the same shall, by the deputy inspector, be directed or permitted to take to the dip works, shall, upon conviction thereof, be punished by a fine of not less than five hundred dollars ($500) nor more than two thousand dollars ($2,000), or by imprisonment not to exceed six months, or by both said fine and imprisonment.

Superintendence and expenses of dipping.

SEC. 10. Such deputy sheep inspector, or competent persons appointed by him, shall superintend all dipping provided for in this act, and shall have full and complete power to enforce and designate the strength, heat, and length of time such sheep shall be in the bath, and all expenses incurred in so doing, including a compensation of five dollars ($5) for every day or part of a day in which said deputy sheep inspector or persons appointed by him may be engaged in dipping said sheep, shall become and is hereby made a first lien upon said sheep, and, if the same is not paid within ten days, he shall sell so many of said sheep as may be necessary to realize sufficient money to pay said sum due him, together with the costs and charges of the sale, including five dollars ($5) per day for each day he holds said sheep. Such sale shall be made and conducted in the same manner as sales of personal property on execution out of the district court.

Penalty for failure to dip.

SEC. 11. The owner or owners or controller of any sheep, or the deputy inspector or persons appointed by him, who shall fail to dip said sheep, as required by the provisions of this act, shall be guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not less than three hundred dollars ($300) nor more than five hundred dollars ($500), or by imprisonment in the county jail for a period of not less than two months nor more than six months, or by both such fine and imprisonment.

Dipping at lambing time.

SEC. 12. No person, persons, company, corporation, or association within the State of Idaho shall be required to dip his or their band or bands of ewes, or any part of them, within ten days of the commencing of lambing and fifty days thereafter, of any year, but such sheep when found to be infected shall be held in quarantine and separate and apart from sound sheep; and the owner, owners, or controllers thereof shall be responsible for all damages as stated in this act, to be recovered as herein provided for.

Hand-dressing in quarantine. SEC. 13. It shall also be the duty of said deputy sheep inspector to require the owner, owners, or controllers of sheep, while held in quarantine during the period mentioned in the above section, to spot or hand dress all sheep in their band or bands that show any scab or any contagious or infectious disease with some reliable medicine; and such deputy sheep inspector shall have the power to enforce such hand-dressing or spotting during the period above referred to the same as he has power to enforce dipping at any other period of the year, as provided in this act.

Owners failing to dip. SEC. 14. Should any owner or person in charge of any sheep found to be infected upon examination by the deputy sheep inspector fail or refuse to dip said sheep, or should do so in an improper manner, it shall be the duty of said deputy sheep inspector to seize said sheep and to dip the same. And when the same shall have been dipped he shall notify the owner or person in charge of the amount of the costs, charges, and expenses due from the same.

If such owner or person in charge shall neglect or refuse for the period of ten days after receiving said notice to pay the same together with all further costs, charges, and expenses of holding said sheep, it shall be the duty of the said deputy to sell so many of said sheep as may be necessary to pay the same and all costs and expenses of said sale. Such sale shall be made and conducted as sales of personal property on execution out of district court.

Salary of deputy inspectors. SEC. 15. The deputy sheep inspectors appointed in the several counties or districts, as provided in this act, shall receive five [dollars] ($5) per day for every day or part of a day spent in the performance of his duty, to be paid by the owner or owners of the sheep examined, and to be enforced as a lien against the sheep so examined, as provided in section 14 of this act.

Inspection and charges on entering State. SEC. 16. Any person, persons, company, corporation, or association, or any agent or employé of any person, persons, company, corporation, or association, who shall drive or herd, or cause to be driven or herded, or shall bring or cause to be brought into the State of Idaho, any sheep from any other State, shall immediately, upon crossing the State line of Idaho, notify the deputy sheep inspector of the county or district where said sheep crossed the State line, and before he shall proceed further than two miles from the said State line into the State of Idaho, he shall make an application, in writing, to such deputy inspector for the inspection of said sheep. Said application must be served on the deputy of that county or district in person or left at his place of residence or by registered letter. Said notice must state the time and place said sheep crossed the State line, and the locality from whence they came, and must give the name and residence of the owner of said sheep and the name of the herder or controller, the number of sheep and the brands of said sheep, and for each band of sheep of 3,000 head or less, the party making the application shall deposit with the deputy inspector the sum of ten dollars ($10) to cover the cost of inspection of said sheep.

Any deputy sheep inspector on receiving such notice shall at once proceed to inspect said sheep as set forth in the application, and if, upon inspection, said deputy inspector shall deem it necessary or advisable so to do to prevent or avoid infection therefrom, he shall cause said sheep to be quarantined at some place not more than two miles from the said State line where said sheep entered the State of Idaho, for a period of not more than ninety days, and if deemed necessary by him, said inspector shall cause said sheep to be dipped at least twice, at the option of the said deputy inspector, before they are released from such quarantine.

Any person, persons, company, corporation, or association, or his or their agent or employé, who shall ship by railroad into this State from any other State, any sheep, shall, before such sheep are unloaded at any point or place within this State, notify personally the deputy inspector of the district within which it is intended to unload such sheep, and thereupon said deputy inspector shall forthwith proceed to inspect, quarantine, and dip said sheep as in this section heretofore provided.

Any person violating any of the provisions of this section shall be guilty of a misdemeanor and shall be fined, upon conviction thereof, in a sum not less than five hundred dollars ($500) and not exceeding five thousand dollars ($5,000), which fine shall be a lien upon said sheep, and shall be enforced by proper proceedings in any court of competent jurisdiction.

SEC. 17. It shall be the duty of the deputy sheep inspector, upon receipt of such notice of sheep having crossed the State line in his district, at once to inspect the same, as provided in the preceding section, and said sheep must remain within two miles of said State line until so inspected.

Any person or persons violating any of the provisions of this section shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not less than five hundred dollars ($500) nor more than five thousand dollars ($5,000).

When sheep are brought into this State, in violation of section 16 of this act, it shall be the duty of the deputy sheep inspector of the district or county wherein said sheep may be, immediately to seize the same and hold them, and file a complaint in a court of competent jurisdiction, charging the owner or person in charge of said sheep with a violation hereof, and, upon the conviction of the defendant in said action, the said deputy shall (unless all fines, costs, and charges be immediately paid) sell, in the same manner as sales of personal property on execution out of the district court, so many of said sheep as may be necessary to pay the costs and charges of making such sale, including the compensation due him, together with the fine imposed in such action. And a certified copy of the judgment in such action shall be his sufficient warrant for doing the same.

Penalty for importing infected sheep. SEC. 18. It is unlawful for any person, persons, company, corporation, or association to drive, or cause to be driven, bring or cause to be brought, into the State of Idaho from any other State any sheep infected with scab or any contagious or infectious disease. Every person so offending shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine of not less than five hundred dollars ($500) and not exceeding five thousand dollars ($5,000), or by imprisonment in the county jail for not less than six months nor more than one year, or by both such fine and imprisonment, for each and every herd or band of such sheep consisting of three thousand head or less, so brought into this State. And said sheep shall be seized, held, and sold to satisfy the costs of seizure and the payment of any fine that shall be imposed by any court of competent jurisdiction in the manner provided for in section 17 hereof.

Traveling permit for infected sheep. SEC. 19. Any person, persons, company, or corporation or association within the State desiring to move his or their sheep, which are not sound, or are infected by scab or other infectious or contagious disease, shall first obtain from the deputy sheep inspector a traveling permit. Such permit shall only be granted for the purpose of removing said sheep to the nearest suitable point where there are available dipping works, or where they can be constructed, at which place said sheep shall be dipped. Such sheep shall travel to said point over a route designated by the deputy sheep inspector.

Herders to be notified. The person or persons moving said sheep shall first notify all parties herding sheep along or over said route that the infected sheep have to travel of the time they will pass over said route. And any person, persons, company, corporation, or association injured or damaged by reason of the moving of said sheep shall be entitled to recover from the person, persons, company, corporation, or association moving the same, in civil action, the amount of damage, direct and consequential: *Provided, however,* No party shall be entitled to recover damages who voluntarily herd, or cause to be herded, any sheep on quarantined ground. Said sheep so voluntarily herded shall be considered as scabby without inspection, and shall be treated as provided in section 9 hereof.

Penalty. Any person or persons violating any of the provisions of this section shall be guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine of not less than five hundred dollars ($500) nor more than one thousand dollars ($1,000) or by imprisonment in the county jail for not less than two months nor more than six months, or by both such fine and imprisonment.

Inspectors' liability. SEC. 20. Any deputy sheep inspector granting a permit allowing sheep to travel, without at the time having first examined the sheep, shall be guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not less than three hundred dollars ($300) and not more than five hundred dollars ($500).

Owners must report disease within fifteen days. SEC. 21. Any person or persons owning or having under their control sheep or bands of sheep which have become infected with the scab or other infectious or contagious disease for a period of fifteen days without reporting the fact to the deputy sheep inspector of such county or district thereof where such sheep are situate, in writing, shall be guilty of a misdemeanor, and shall, upon conviction thereof, be punished by a fine of not less than five hundred dollars ($500) nor more than one thousand dollars ($1,000) or by imprisonment in the county jail for not less than two months nor more than six months, or by both such fine and imprisonment. Such fine, if not immediately paid, shall be collected, together with all costs and charges, by seizure and sale of the sheep, as provided in section 17 hereof.

Placing sheep in another's corral. SEC. 22. It shall be unlawful for any person, persons, company, corporation, or association to drive or cause to be driven any sheep into any sheep corral the property of another without first having obtained in writing the consent of the owner or person having control or custody of such sheep corral.

Penalty. Any person, persons, company, corporation, or association violating any of the provisions of this section shall be guilty of a misdemeanor, and, upon conviction thereof, shall be punished by fine of not less than two hundred dollars ($200) nor more than five hundred dollars ($500) or imprisonment in the county jail for not less than six months nor more than one year, or by both such fine and imprisonment.

Definition of owner. SEC. 23. In any action or proceeding, civil or criminal, arising under this act, all persons having any interest in sheep or controlling the same, and concerning which said action or proceeding is had, shall be deemed the owner of said sheep, and shall be liable, jointly and severally, for such violation.

Herder must give information to inspector. Any herder or shepherd or other person in charge of sheep may be sworn to give any deputy sheep inspector any and all information as to the condition of the sheep in his charge, to the best of his knowledge, on being requested so to do by the deputy, and upon refusing to do so shall be guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine of not less than one hundred dollars ($100) nor more than three hundred dollars ($300) or by imprisonment in the county jail for not less than two months nor more than six months, or by both such fine and imprisonment.

Marks and brands and deputies' reports. SEC. 24. It shall be the duty of each deputy sheep inspector appointed under this act to keep a book in which he shall record as complete a description as practicable of the marks and brands with which each person in his county or district marks or brands his sheep, and the owners of sheep shall report, in writing, to such deputy sheep inspector their marks and brands for the purpose of aiding such deputy sheep inspector to make up and keep such records. Such deputy sheep inspectors are also required to keep a book in which they shall record the name of all persons prosecuted for violation of this act, together with a description of the particular offense charged against him or them, the name of the court in which the prosecution was had, and the result of such prosecution, giving the amount of fines, where fines are imposed. And on the first day of January of each year each deputy sheep inspector appointed under the provisions of this act shall make a report to the State sheep inspector; at the end of each inspection period shall state the condition in his county or district and the number of cases of scab, which report shall contain a true and correct copy of his record as contained in the books required by him to be kept under the provisions of this act, which report shall be placed on file in the office of the State sheep inspector. Said deputy inspector shall also keep a record showing the names of the owners or controllers of and the number and brands of all sheep inspected and quarantined by him under the provisions of section 16 of this act, together with the cause of quarantine, when the same shall have been imposed, and the length of time such quarantine was continued.

Common carriers must have certificate of inspection. SEC. 25. It shall be unlawful for any person, persons, company, corporation, or association owning, controlling, or managing a ferryboat, toll bridge, car, steamboat, or other things used for transportation in the State of Idaho to allow any sheep destined to points within the State to be loaded thereon unless the party in charge of said sheep shall first produce a certificate from a deputy sheep inspector appointed under this act that said sheep are free from scab, scabies, and other infectious or contagious disease: *Provided*, That this shall in no case apply to sheep being shipped out of the State. Any violation of this section shall be deemed a misdemeanor and punishable by a fine of not less than five hundred dollars ($500) nor more than one thousand dollars ($1,000).

Stray sheep to be reported. SEC. 26. If any person, persons, company, or corporation in driving or herding any sheep should get into his or their herd any stray sheep, he or they must, within five days after discovering the fact, notify the owner thereof; and if the owner is unknown he or they shall forthwith notify the deputy sheep inspector of such county, giving the number of such sheep and the brands of each.

Penalty. Any person, persons, company, corporation, or association violating the provisions of this section shall be guilty of a misdemeanor, and, upon conviction thereof, shall be fined not less than one hundred dollars ($100) nor more than three hundred dollars ($300).

Deputies have power to arrest. SEC. 27. All deputy sheep inspectors are hereby given the power, and it is made their duty, to arrest and bring before a justice of the peace, or other court having jurisdiction of the same, all persons found violating any of the provisions of this act, where a complaint shall be filed by such deputy sheep inspector, either upon his own knowledge or upon information of such violation; whereupon a hearing shall be had as in other like criminal cases; and such deputy sheep inspectors are hereby vested with the same authority to arrest, and to require aid, in the execution of their said office, as sheriffs and their deputies of the several counties of the State: *Provided*, That the provisions of this act requiring the deputy sheep inspector to prosecute for a violation of the provisions hereof shall not be construed so as to prevent such prosecution from being commenced and prosecuted by other persons as criminal actions are commenced and prosecuted in other cases.

Deputies' fee for prosecution. The deputy sheep inspectors, as full compensation for their services in prosecutions under this act, shall be allowed five dollars ($5) per day, and same shall be assessed as costs in the case against the defendant.

Law of 1899 repealed. SEC. 28. An act entitled "An act to suppress contagious and infectious disease of sheep; to create the office of State sheep inspector and of deputy sheep inspectors, to provide for the appointment of the same and fix their compensation; making the doing of certain acts a crime and providing for the punishment of the same, and for other purposes," approved February 25, 1899, is hereby repealed.

Repealing clause. SEC. 29. All acts and parts of acts in conflict with this act are hereby repealed.

Emergency. SEC. 30. Whereas an emergency exists therefor, this act shall be in force and take effect from and after its passage.

Approved March 7, 1901.

INDIANA.

AN ACT Entitled an act to establish the office of State veterinarian of Indiana, to provide for the appointment of the State veterinarian by the governor, and to provide for the control and suppression of dangerous, contagious, and infectious diseases among domestic animals, making an appropriation for expenses of the same, and for the repeal of all laws or parts of laws conflicting herewith.

Be it enacted by the General Assembly of the State of Indiana:

State veterinarian, qualifications, etc. SECTION 1. That an office is hereby established, to be known as the State veterinarian of Indiana. The office of State veterinarian of Indiana shall be filled by appointment by the governor; the person so appointed shall be a competent and qualified veterinarian of large experience, and shall be a graduate of a reputable veterinary college in the United States, Canada, or Europe. The term of office of the State veterinarian shall be four years, but he may be removed for cause.

Duties of State veterinarian. SEC. 2. That it shall be the duty of the State veterinarian to protect the health of the domestic animals of the State, and to determine the most efficient and practical means for the prevention, suppression, control, and eradication of dangerous, contagious, and infectious diseases, and to investigate the cause, nature, means of prevention, and treatment of such diseases as he may deem advisable, and for these purposes he is hereby authorized and empowered to establish, maintain, enforce, and regulate such quarantine and other measures relating to the movements and care of animals and their products, the disinfection of suspected localities and articles, and the destruction of such animals and property as he may deem necessary, and to adopt from time to time all such regulations as may be necessary and proper for the carrying out of the purposes of this act: *Provided, however,* That in the case of any slowly contagious disease, only suspected or diseased animals shall be quarantined.

Appraisal of condemned animals. SEC. 3. That when it shall be deemed necessary to kill any animal or animals, or to destroy any property to prevent further spread of disease, the State veterinarian or his agent may adjust the claim with the owner or his agent: *Provided,* That the amount to be paid is less than twenty-five dollars ($25); if the claim exceed twenty-five dollars ($25), or an agreement can not be made with the owner or claimant for the amount thereof, three appraisers, who shall be freeholders in the county, shall be appointed, one by the State veterinarian or his agent, one by the owner or claimant, and a third by the two appointed, as aforesaid, who shall under oath or affirmation appraise the animal, animals, or property, taking into consideration their or its actual value at the time of appraisement, and such appraisement shall be paid in the same manner as other expenses under this act are provided for: *Provided,* That under such appraisement not more than twenty-five dollars ($25) shall be paid for any infected animal: *And provided further,* The right to indemnity does not exist and the payment of such must not be made in the following cases:

For animals belonging to the United States;

For animals belonging to the State;

For animals brought into the State contrary to the rules and regulations of the State veterinarian;

For animals found to be diseased, or that are destroyed because they have been exposed to disease before or at the time of their arrival in the State;

For an animal which was previously affected by any other disease which from its nature and development was incurable and necessarily fatal;

For an animal which the owner knowingly or wittingly purchased affected with disease, or from a place where contagious disease was known to exist.

Dipping of sheep. SEC. 4. That all sheep consigned to or passing through stock yards shall be dipped before leaving, if intended for any other purposes than immediate slaughter in the State, the time of dipping, the manner of dipping, and kind of dip used to be subject to the approval of the State veterinarian: *Provided,* That in the winter and at such times as the dipping of sheep would be hazardous to their health, the sheep may be withdrawn upon permit from the State veterinarian, which permit shall be issued upon the written agreement of the owner that the sheep will remain in his possession, and that he will dip at such future time and in such manner as the State veterinarian may direct. That all sheep found affected with scabies shall be dipped at such time and in such manner and with such dip as the State veterinarian shall direct, and at the expense of the owner.

Power to enter premises, etc. SEC. 5. That the State veterinarian or his authorized agent shall at all times have the right to enter any premises, farms, fields, pens, abattoirs, slaughterhouses, buildings, cars, or vessels where any domestic animals are at the time quartered, or wherever the carcass of any one may be, for the purpose of examining it in any way that may be deemed necessary to determine whether they are or were the subjects of any contagious or infectious disease.

Cooperation with United States Government. SEC. 6. That the State veterinarian may accept in behalf of the State the rules and regulations prepared and adopted by the Department of Agriculture of the United States for the suppression of any contagious diseases among domestic animals, and shall cooperate with the authorities of the United States in the enforcement of such rules and regulations.

Powers of United States inspectors. SEC. 7. That the inspectors of the Bureau of Animal Industry shall have the same right of inspection, quarantine, and condemnation of animals affected with any contagious or infectious disease or suspected to be so affected, or that may have been exposed to any such disease, and for such purposes they may enter upon any ground or premises, they may call upon the sheriffs, constables, and other peace officers to assist them in the discharge of their duties, and such sheriffs, constables, or peace officers shall assist such inspectors when so requested, and such inspectors shall have the same power and protection as peace officers when in the discharge of their duties: *Provided,* That this State shall not be liable for any damages or expenses caused or made by such inspectors.

Governor may prohibit importation. SEC. 8. That whenever the governor has good reasons to believe that any disease has become epidemic in another State or Territory, and that the importation of animals from such State or Territory would be prejudicial to the health of the domestic animals of this State, he must, by proclamation, designate such locality or localities and prohibit the importation therefrom of any live stock of the kind diseased, except under such rules and regulations as the State veterinarian shall prescribe.

Owners to report disease. SEC. 9. That any person knowing or suspecting a dangerous, contagious, or infectious disease to exist among live stock shall report the same to the local health officer, who shall, within twenty-four hours, report the same to the State veterinarian. The State veterinarian or his agent shall visit the locality and make an examination of the suspected stock and prescribe and enforce such rules and regulations as may be necessary: *Provided*, That an owner of an animal or animals affected with a dangerous or contagious disease shall report the same within forty-eight hours after knowing such to exist.

Inspection of dairies, etc. SEC. 10. The State veterinarian shall, as far as possible, investigate such diseases of animals as are communicable to man, and such conditions of dairies as the State board of health may request.

General penalty. SEC. 11. Any person or persons, any company or corporation, wilfully violating any of the provisions of this act, or any regulation or order of the State veterinarian or agent appointed by him shall be deemed guilty of misdemeanor, and shall, upon conviction, be punished by a fine not exceeding one hundred dollars ($100), or by imprisonment not exceeding thirty days, or both, at the discretion of the court.

Assistance and supplies. SEC. 12. That the State veterinarian is hereby empowered to appoint and employ such assistants or agents, and to purchase supplies and materials as may be necessary in carrying out the provisions of this act: *Provided*, That the sum expended for supplies and materials shall not exceed two hundred dollars ($200) in any one year. That the State veterinarian or his duly appointed agents are empowered to administer oaths or affirmations, that they may make such examinations into the conditions of the live stock of the State in relation to contagious and infectious diseases, including milk supplies of cities, towns, and villages, as may seem necessary, and to take proper measures to protect such milk supplies from contamination. The decision of the State veterinarian in all matters pertaining to diseases of domestic animals and his orders as to their disposition shall be final. He may call upon any peace officer for assistance in the discharge of his duties, and such peace officer shall give assistance.

To publish rules and regulations. SEC. 13. That the State veterinarian shall, from time to time, publish the rules and regulations pertaining to the control and suppression of dangerous, contagious, and infectious diseases of domestic animals, and such regulations shall have the force and effect of laws of the State of Indiana. He shall make an annual report to the governor of all work done and a statement of expenditures.

Salaries and accounts. SEC. 14. That the governor, auditor of state, and treasurer of state shall constitute a committee to determine the salary of the State veterinarian and to audit his accounts, and upon the certification by the governor to the auditor of State the amount due the State veterinarian and assistants for salary and expenses the auditor shall draw his warrant upon the treasurer for said amount in favor of the State veterinarian and assistants, respectively, payable out of the funds hereinafter appropriated; and upon further certification by the governor to the auditor of State of the amount due any person for an animal or animals condemned or property destroyed, the auditor shall draw his warrant upon the treasurer for the amount so certified, payable out of the funds hereinafter appropriated: *Provided*, That said committee shall not receive additional compensation for said work: *And further provided*, That the salary of the State veterinarian shall not exceed twelve hundred dollars ($1,200) and necessary traveling expenses in one year, and that not more than eight hundred dollars ($800) shall be allowed for assistants.

Appropriation. SEC. 15. That the sum of three thousand dollars ($3,000) is hereby appropriated annually for carrying out the provisions of this act.

Law of 1889 repealed. SEC. 16. That an act entitled "An act to provide for a live-stock sanitary commission and a State veterinarian, and to prescribe their powers and duties, and to prevent and suppress contagious and infectious diseases among the live stock of the State, and to declare an emergency," approved March 9, 1889, and all other laws and parts of laws in conflict therewith, be and the same are hereby repealed.

Approved, March 6, 1901.

KANSAS.

AN ACT Supplementary to and amendatory of chapter 139 and chapter 142 of the General Statutes of Kansas, 1897, and to repeal sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 14, and amend sections 15 and 16 of said chapter 139 of the General Statutes of Kansas, 1897, and to amend sections 2, 13, 14, and 19 of chapter 142 of the General Statutes of Kansas, 1897, and to enlarge the powers and duties of the live-stock sanitary commission, to provide for the inspection of cattle and fix fees therefor, to provide for the appointment of live-stock inspectors and clerk by the live-stock sanitary commission, and fix compensation of persons so appointed, and to provide punishment for the violation of the provisions hereof.

Be it enacted by the Legislature of the State of Kansas:

SECTION 1. That sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 14 of chapter 139 of the General Statutes of Kansas, 1897, be and the same are hereby repealed.

Quarantine regulations. SEC. 2. That section 15 of chapter 139 of General Statutes of Kansas, 1897, be and hereby is amended to read as follows:

"SEC. 15. Whenever the live-stock sanitary commission shall determine that certain cattle or other animals within the State are capable of communicating or liable to impart Texas, splenic, or Spanish, fever, or any other infectious or contagious disease, they shall issue their order to the sheriff or any constable of the county in which such cattle or other animals are found, commanding him to take and keep such cattle or other animals in his custody, subject to such quarantine regulations as they may prescribe, until such time as shall be prescribed by the commission, on which date they shall direct such officer to deliver said cattle or other animals to their owner or owners or his or their agent.

Costs of quarantine. "Before any cattle or other animals shall be delivered as aforesaid there shall be paid to said live-stock sanitary commission all costs and expenses of taking and detaining and holding said cattle or other animals; and in case such costs and expenses are not so paid at the time fixed by said commission, the said officer shall advertise, in the same manner as is by law provided in cases of sale of personal property on execution, that he will sell such cattle or other animals, or such portion thereof as may be necessary to pay such costs and expenses, together with the costs and expenses of such sale; and at the time and place so advertised he shall proceed to sell as many of said cattle or other animals as may be necessary to pay for such costs and expenses and the expenses of such sale, and shall forthwith pay over to the live-stock sanitary commission any amount so received in excess of the legal fees and expenses of such officer; and any officer performing any of the duties enjoined in this section or any other section of this act shall receive the same compensation therefor as is prescribed by law for similar services, and in case such fees can not be collected by the sale of such stock they shall be paid by the county in which such stock was held."

Shipping diseased cattle. SEC. 3. That section 16 of chapter 139 of the General Statutes of Kansas, 1897, be and the same is hereby amended to read as follows:

"SEC. 16. Any person or persons who shall drive, ship, or transport, or cause to be driven, shipped, or transported, into or through any county in this State any cattle liable to or capable of communicating Texas, splenic, or Spanish, fever to any domestic cattle of this State shall be liable to any person or persons injured thereby for all damages that they may sustain by reason of the communication of said diseases of Texas, splenic, or Spanish, fever, to be recovered in a civil action in any court of competent jurisdiction, and the parties so injured shall have a lien for such damages on the cattle communicating the disease of Texas, splenic, or Spanish, fever."

Duties of secretary of commission. SEC. 4. That section 2 of chapter 142 of the General Statutes of Kansas, 1897, be and the same hereby is amended to read as follows:

"SEC. 2. Said commissioners shall elect one of their members chairman, one of their members secretary, and it shall be the duty of the secretary to make and keep a record of all of the official acts and proceedings of the commission and its members and report the same to the governor annually, and oftener, if required, for publication. Such annual report shall include an itemized statement of the expenditures and disposition of all funds coming into the possession of the commission, and of the amount of compensation received by said commission, and all expenses incurred by said commission in the performance of their duties, and a statement of all animals directed to be killed, together with the appraised value thereof; and for such purposes the commission may appoint and employ one clerk, at a salary not exceeding six hundred dollars ($600) per annum."

Owners to report disease. SEC. 5. That section 13 of chapter 142 of the General Statutes of Kansas, 1897, be and the same hereby is amended to read as follows:

"SEC. 13. It shall be the duty of any owner or person in charge of any domestic animal or animals, who discovers, supposes, or has reason to believe that any domestic animal owned by him or in his charge or keeping is affected with Texas, splenic, or Spanish, fever, or any other contagious or infectious disease, to immediately report such fact, belief, or supposition to the live-stock sanitary commission or some member thereof and to the sheriff and county clerk of the county in which such domestic animal is kept or found; and it shall be the duty of any person who discovers the existence of any contagious or infectious disease among the domestic animals of any person to report the same at once to the sheriff and county clerk of the county in which such domestic animals are kept or found."

Duties of sheriff. SEC. 6. That section 14 of chapter 142 of the General Statutes of Kansas, 1897, be and the same hereby is amended to read as follows:

"SEC. 14. The sheriff to whom the existence of any Texas, splenic, or Spanish, fever or any other contagious or infectious disease of domestic animals is reported shall forthwith proceed to the place where such domestic animal is and examine the same, and forthwith report the result of such examination to the live-stock sanitary commission or any member thereof, and said sheriff shall prescribe such temporary quarantine regulations as will prevent the spread of the disease, contagion, or infection until the live-stock sanitary commission can provide and order suitable quarantine rules and regulations; and any such sheriff who shall take or detain such cattle or other live stock under the provisions of this act shall not be liable to the owner or owners of such cattle or other live stock for any damages by reason of such taking or detention, or by reason of the performance of any other duties enjoined by law."

Owners liable. SEC. 7. That section 19, chapter 142, of the General Statutes of Kansas, 1897, be and the same is hereby amended to read as follows:

"SEC. 19. Any person who shall have in his possession any domestic animals affected with any contagious or infectious disease, knowing such animal to be so affected, or after having received notice that such animal is so affected, who shall permit such animal to run at large or who shall keep such animal where other domestic animals not affected with or previously exposed to such disease, contagion, or infection, or who shall sell, ship, drive, trade, or give away such diseased and infected animal or animals which have been exposed to such infection and contagion, or who shall move or drive any domestic animal in violation of rules, regulation, direction, or order establishing and regulating quarantine, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than one hundred ($100) or more than five hundred dollars ($500) for each of such diseased or exposed domestic animals which he shall permit to run at large or keep, or sell, ship, drive, or trade, or give away in violation of the provisions of this act: *Provided*, That any owner of any domestic animal which has been affected with or exposed to any contagious or infectious disease may dispose of the same after they [he] obtain[s] from the live-stock sanitary commission a bill of health for such animal."

Cattle carrying ticks. SEC. 8. All cattle being at or brought from any point south of the south line of the State of Kansas, and carrying *Boophilus bovis*, or Southern ticks, are deemed to be infected with and capable of communicating Texas, splenic, or Spanish, fever, and such cattle shall not be shipped or transported into the State of Kansas except for immediate slaughter, and then only under such rules and regulations as may be prescribed by the live-stock sanitary commission.

Southern cattle to be inspected. SEC. 9. It shall be unlawful for any person or persons to bring, drive, or transport any cattle into any county of the State of Kansas, except for immediate slaughter, as provided in the preceding section, from any point south of the south line of Kansas, without having first caused such animal or animals to be inspected and passed under certificate of health by the live-stock sanitary commission of this State, or some inspector thereof; and any person or persons violating the provisions of this section shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not less than fifty ($50) nor more than one thousand dollars ($1,000), or by imprisonment in the county jail not less than thirty days nor more than one year, or by both such fine and imprisonment.

Inspection stations. SEC. 10. The live-stock sanitary commission is hereby authorized and empowered to establish stations along the south line of the State of Kansas for the inspection and admission of cattle into the State, as may be necessary to afford reasonable convenience for the inspection and admission of such cattle as are healthy and, being free from infection and contagion, may be entitled to admission under the laws of Kansas; and such commission shall appoint competent inspectors, and station them at such points and places as the commission may deem necessary for the accommodation of the business interests and protection of the live stock in the State of Kansas, by the prompt and thorough inspection of cattle brought into this State: *Provided*, That the number of inspectors so appointed shall not at any time exceed seven.

Duties of inspectors. SEC. 11. It shall be the duty of such inspectors so appointed by the live-stock sanitary commission to promptly examine and inspect all cattle presented for admission into this State from any point south of the south line of the State of Kansas, and if, upon such inspection, the same shall be found free from any infection or contagion, and clean of and not carry any *Boophilus bovis*, or Southern ticks, he shall make out and deliver to the owner or person in charge of said cattle a certificate that the same have been inspected and found to be healthy and free from infection and contagion.

Inspection fees. SEC. 12. Any owner or owners of cattle required to be inspected under the provisions of the preceding section shall not be entitled to have such inspection made until he shall have paid or tendered to the live-stock sanitary commission, or some member thereof, or some person appointed and authorized to make inspection for said commission, an inspection fee of two (2) cents for each head so to be inspected, which fee, when collected by the commission, commissioner, or inspector, as aforesaid, shall be paid into the State treasury of the State of Kansas, and become a fund for the payment of salaries of such inspection: *Provided*, That the provisions of this section shall not apply to shipments made to points not within the State of Kansas, nor to points within the State of Kansas, if such shipments are for immediate slaughter.

Salary of inspectors. SEC. 13. The inspectors hereinbefore provided shall receive as full compensation for their services the sum of one hundred dollars ($100) per month, to be paid out of the funds in the State treasury derived from the fees collected as provided in the last preceding section; but if from any cause said fund shall at any time be insufficient to pay such salaries, then the same shall be paid as the salaries of other State officers.

SEC. 14. That sections 15 and 16, of chapter 139 of the General Statutes of Kansas, 1897, and sections 2, 13, 14, and 19, of chapter 142 of the General Statutes of Kansas, 1897, be, and the same are hereby, repealed.

SEC. 15. This act to take effect and be enforced from and after its publication in the official State paper.

Approved February 28, 1901.
Published in official State paper March 15, 1901.

MASSACHUSETTS.

AN ACT Relative to infectious diseases among domestic animals.

Be it enacted, etc., as follows:

Law of 1899 amended. Section eight of chapter four hundred and eight of the acts of the year eighteen hundred and ninety-nine is hereby amended by inserting after the word "killed," in the twenty-sixth line, the words: "or if such animal has been inspected and proof satisfactory to said board has been furnished to it, by certificate or otherwise, of the freedom of such animal from disease," so as to read as follows:

Animals condemned. SEC. 8. When the board of cattle commissioners or any of its members or agents, by examination of a case of contagious disease among domestic animals, is convinced that the public good requires it, the board, commissioner, or agent shall cause such animal or animals to be securely isolated, or shall cause it or them to be killed without appraisal or payment. Such order for killing shall be issued in writing by the board or any of its members, and may be directed to an inspector or other person, and shall contain such direction as to the examination and disposal of the carcass, and the cleansing and disinfecting of the premises where such animal was condemned, as the board or commissioner shall deem expedient.

Payment to owner. "A reasonable sum may be paid out of the treasury of the Commonwealth for the expense of such killing and burial. If it shall subsequently appear, upon postmortem examination or otherwise, that such animal was free from the disease for which it was condemned, a reasonable sum therefor shall be paid to the owner by the Commonwealth. Whenever any cattle condemned as afflicted with the disease of tuberculosis are killed under the provisions of this section, the full value thereof at the time of condemnation, not exceeding the sum of forty dollars ($40) for any one animal, shall be paid to the owner out of the treasury of the Commonwealth if such animal has been owned within the State six months continuously prior to its being killed, or if such animal has been inspected and proof satisfactory to said board has been furnished to it, by certificate or otherwise, of the freedom of such animal from disease: *Provided, however,* That such person shall not have, prior thereto, in the judgment of the board, by willful act or neglect, contributed to the spread of tuberculosis; but such decision on the part of the commissioners shall not deprive the owner of the right of arbitration as hereinafter provided."

Approved April 4, 1901.

MINNESOTA.

AN ACT To amend chapter 233 of the the General Laws of 1897 entitled "An act to prevent the spread of contagious and infectious diseases among domestic animals in this State."

Be it enacted by the Legislature of the State of Minnesota:

Regulations for quarantine, etc. SECTION 1. That section one of chapter two hundred and thirty-three of the General Laws of the State of Minnesota for the year 1897, entitled "An act to prevent the spread of contagious and infectious diseases among domestic animals in this State," be, and the same is hereby, amended to read as follows:

"SECTION 1. Authority is hereby given to the State board of health, and to the several local boards of health of the towns, villages, and cities of this State, to take all steps they may severally deem necessary to control, suppress, and eradicate any and all contagious and infectious diseases among any of the domestic animals in this State, and to that end said board are hereby severally empowered, within their respective jurisdictions, to quarantine any domestic animal which is infected with any such disease, or which has been exposed to infection therefrom; to kill any animal so infected, and whenever deemed necessary by the State board of health, to kill any animal which has been exposed to the infection of any such disease; to regulate or prohibit the arrival in or departure from this State, and the towns, villages, and cities thereof, of any such exposed or infected animal, and, at the cost of the owner thereof, to detain any domestic animal found in violation of any such regulation or prohibition; to adopt all such rules and regulations as may be by such several boards deemed necessary or expedient to enforce the authority hereby given; and said State board of health is hereby expressly given authority to regulate or prohibit the shipment into this State of any domestic animal which, in the judgment of said board, may endanger the public health: *Provided,* That no board of health shall by any rule or regulation thereof prohibit the sale, disposal, or removal of any domestic animal by any person or persons, or from any place, when said animal has no contagious disease, or has not been exposed to any contagious disease, and that the fact that animals are upon the same premises with others having a contagious disease shall not of itself be construed as evidence of exposure to such contagious disease as is had by said other animals."

SEC. 2. This act shall take effect and be in force from and after its passage.

Approved April 9, 1901.

AN ACT To amend sections 5 and 12 of chapter 233 of the laws of 1897, entitled "An act to prevent the spread of contagious and infectious diseases among domestic animals in this State."

Be it enacted by the Legislature of the State of Minnesota:

Rights of owners when animals ordered killed.

SECTION 1. That section five of chapter two hundred and thirty-three of the laws of 1897 be, and the same is hereby, amended so as to read as follows:

"SEC. 5. Whenever a domestic animal has been adjudged to be infected with a contagious or infectious disease, and has been ordered killed by the State board of health, or by a local board of health, the owner or keeper of such animal shall be notified thereof, and within twenty-four hours thereafter he may file a protest with the board of health which has ordered such animal killed against the killing thereof, and shall therein state, under oath, that to the best of his belief such animal is not infected with any contagious or infectious disease; whereupon, said animal being killed notwithstanding such protest, a postmortem examination thereof shall be made by experts, appointed one by the board of health—one by the owner, and one by the two already appointed—and if upon such examination said animal shall be found to have been entirely free from contagious or infectious disease there shall be appointed three competent and disinterested men—one by the board of health, one by the owner of the animal killed, and the third by the two already appointed—to appraise it at its cash value immediately before it was killed, and the amount of such appraisal shall be paid to the owner of such animal, one-fifth part thereof by the town, village, or city where the animal was kept, and four-fifths thereof by the State.

Appraisals.

"All appraisements made under this act shall be in writing and signed by the appraisers and certified to by the local board of health and the State board of health, respectively, to the governor of the State and to the treasurer of the several towns, villages, and cities wherein the animals appraised were kept. Upon the filing of any such appraisement it shall be the duty of the State board of health with which the same is filed to make a certificate, under their hands, of the number of days served by the appraisers in making their appraisement, and upon the filing of such certificate with the State treasurer, such treasurer shall pay each of said appraisers one dollar ($1) per day for his services as such appraiser.

Payment for animals killed.

"Whenever any such animal has been adjudged infected with the disease of tuberculosis, and has been ordered killed by the State board of health or by a local board of health, and is killed in accordance therewith, the value of such animal, less the value of the carcass thereof, shall be determined as hereinbefore specified, and shall be paid for to the owner as follows: One-third of the value thereof shall be paid by the State, one-third thereof by the town, village, or city where the animal is kept, and the remaining one-third thereof shall be borne by the owner of such animal.

"Payment in such cases shall be made by the State and such town, village, or city, as hereinbefore set forth: *Provided, however,* That in no case shall the appraised value of such animal exceed the sum of forty dollars ($40), nor shall any payment be made for the killing of any such animal infected with said disease of tuberculosis unless such animal was owned and kept in good faith in this State for at least the space of one year next prior to the killing thereof.

"Whenever any such animal which has not been adjudged to be infected is killed by order of said board, but not by the owner or keeper thereof, a postmortem examination thereof shall be made by experts, appointed as aforesaid, and if found to have been entirely free from any infectious disease the value of such animal shall be determined and paid for as hereinbefore specified. Except as in this section expressly provided, no compensation shall be paid for any animal killed by virtue of any authority given by this act."

Appropriation.

SEC. 2. That section twelve of chapter two hundred and thirty-three of the laws of 1897 be, and the same is hereby, amended so as to read as follows:

"SEC. 12. The sum of nineteen thousand dollars ($19,000), or so much thereof as is necessary, is hereby annually appropriated for the payment of the expenses that may be incurred by the State in enforcing this act, such expense to be approved by the State board of health and by the governor."

SEC. 3. This act shall take effect and be in force from and after its passage.

Approved April 13, 1901.

MONTANA

AN ACT Amending section 3018 of Article V, Chapter V, Part III, Title VII, of the Political Code, relating to the appointment and compensation of deputy veterinary surgeons.

Be it enacted by the Legislative Assembly of the State of Montana:

SECTION 1. That section 3018 of Article V, Chapter V, Part III, Title VII, of the Political Code be, and the same is hereby, amended so as to read as follows:

"SEC. 3018. The veterinary surgeon has power to appoint from time to time one deputy at any time he can not personally attend to all the duties required by his office, at a salary not to exceed five dollars ($5) per day for each day actually employed, together with his actual and necessary traveling expenses, to be paid out of the stock indemnity fund."

SEC. 2. This act shall be in effect from and after its passage and approval.

Approved March 16, 1901.

AN ACT To prevent the slaughter and sale of big-jawed cattle and cattle having any other disease, and prescribing punishment therefor.

Be it enacted by the Legislative Assembly of the State of Montana:

SECTION 1. Any person who shall slaughter, sell, or offer for sale for the purpose of food any cattle having big jaw or any other disease shall be guilty of a misdemeanor, and upon conviction thereof shall be punishable by a fine of not exceeding five hundred dollars ($500) or be imprisoned in the county jail not exceeding one year, or by both such fine and imprisonment.

SEC. 2. All acts and parts of acts in conflict herewith are hereby repealed.

SEC. 3. This act shall be in full force and effect from and after its passage and approval by the governor.

Approved March 9, 1901.

NEBRASKA.

AN ACT To amend sections 60, 61, 61a, and 61b, and to repeal section 61c, chapter 4, article 1, Compiled Statutes of Nebraska, 1899, relative to swine diseases, and to repeal said original sections 60, 61, 61a, 61b, and 61c, chapter 4, article 1, Compiled Statutes of Nebraska, 1899.

Be it enacted by the Legislature of the State of Nebraska:

SECTION 1. That section 60 of chapter 4, article 1, of Compiled Statutes of Nebraska, 1899, be, and hereby is, amended to read as follows:

Disposal of diseased carcasses.

"SEC. 60. The owner of any swine which die from disease or sickness shall have the carcasses of the same buried within twenty-four hours after death, at least eighteen inches deep, or have the carcasses burned on the premises where the animal died. Any person violating this section shall be guilty of a misdemeanor, and upon conviction thereof be fined in any sum not to exceed ten dollars ($10)."

SEC. 2. That section 61 of chapter 4, article 1, of Compiled Statutes of Nebraska, 1899, be, and is hereby, amended to read as follows:

Dealing in diseased carcasses.

"SEC. 61. If any person owning, or assuming to own or control, swine, any of which have died from disease or sickness, or shall dispose of the carcasses of said animals for any purpose whatever; or shall render into lard or oil the said carcasses; or if any person who shall buy or receive the carcasses of said dead animals, shall be guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than twenty-five dollars ($25) or more than one hundred dollars ($100), or be imprisoned in the county jail not to exceed three months."

SEC. 3. That section 61a of chapter 4, article 1, Compiled Statutes of Nebraska, be, and is hereby, amended to read as follows:

Removal of diseased carcasses.

"SEC. 61a. If any person shall remove or convey along any public highway, road, alley, or street the carcass of any swine that has died from sickness or disease, shall be guilty of a misdemeanor, and upon conviction thereof shall be fined not less than twenty-five dollars ($25) or more than one hundred dollars ($100), or be imprisoned in the county jail not exceeding three months."

SEC. 4. That section 61b of chapter 4, article 1, Compiled Statutes of Nebraska, be, and is hereby, amended to read as follows:

Possession of diseased carcasses. "SEC. 61b. If any person or company engaged in the business of manufacturing soap, or rendering lard or oil, shall receive or have in their possession the carcass of any swine which has died from sickness or disease, shall be guilty of a misdemeanor, and upon conviction shall be fined not less than twenty-five dollars ($25) or more than three hundred dollars ($300), or be confined in the county jail not to exceed three months."

Law of 1899 repealed. SEC. 5. That sections 60, 61, 61a, 61b, and 61c, chapter 4, article 1, Compiled Statutes of Nebraska, 1899, as the same now exist, be, and the same are hereby, repealed.

Approved March 30, 1901.

AN ACT Concerning the care of and to prevent the spread of contagious and infectious diseases among domestic animals, and to provide for the appointment of a State veterinarian and assistant, to regulate their power and duties, to provide for the compensation, and to repeal sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, and 27 of article 11, chapter 4, Compiled Statutes of Nebraska, 1895, entitled "State veterinarian—live-stock agents."

Be it enacted by the Legislature of the State of Nebraska:

State veterinarian and deputy. SEC. 1. The governor is hereby made the State veterinarian, and he is required within thirty days from the approval of this act and every two years thereafter to appoint one deputy State veterinarian, who shall hold office for a term of two years and until his successor shall have qualified, and who may be removed by the governor at any time for cause.

Assistant veterinarians. SEC. 2. The governor shall appoint such assistant veterinarians as he shall deem necessary for the carrying out of the provisions of this act. The said deputy State veterinarian and assistant veterinarians shall each be a graduate in good standing of a college of veterinary surgery which shall be recognized as such by the American Veterinary Medical Association. They shall have all the powers of the State veterinarian while acting for him in the performance of his duties. They shall be under the direction of the State veterinarian, and shall be required to make reports to him of their official acts at such times as he may deem necessary. The deputy State veterinarian shall receive a salary of $1,500 per annum and his actual traveling expenses, provided same shall not exceed $500 per annum. The assistant veterinarians shall receive, to be paid out of the general fund of the State, five dollars ($5) per day and their actual traveling expenses incurred and paid by them while actually engaged in the discharge of their official duties, provided same shall not exceed $200 per annum.

Bond of deputy. SEC. 3. Before entering upon his duties the deputy State veterinarian shall take and subscribe an oath to faithfully discharge the duties of the office, and shall execute a bond to the State of Nebraska in the sum of five thousand dollars ($5,000), with good and sufficient security, conditional upon the faithful performance of the duties of the office, which bond and security shall be approved by the governor. The said bond, together with the oath of office, shall be deposited in the office of the secretary of State.

Special report by deputy. SEC. 4. The deputy State veterinarian shall make a continuous scientific study, investigation, and research of all contagious diseases of domestic animals, and the causes, preventives, and cures thereof, and report the results of his study and investigation to the governor, giving in plain, ordinary language the symptoms by which any such disease may be identified, how liable to be introduced and spread, the causes and conditions to which it may be attributed, and the introduction of any such diseases and the sanitary and other measures best calculated to prevent the germination and spread of any such contagious or infectious diseases among live stock, together with the best known treatment and remedies, in time for publication in the several reports required by law, and perform such other service as may be required by law or directed by the governor.

Duties of deputy. SEC. 5. It shall be the duty of the deputy State veterinary surgeon, provided for in the first section of this act, to protect the health of the domestic animals of the State from all contagious and infectious diseases of a malignant character, and for this purpose he is hereby authorized and empowered to establish, maintain, and enforce such quarantine, sanitary, and other regulations as he may deem necessary, subject to the approval of the governor. It shall be the duty of the deputy State veterinarian, upon receipt by him of reliable information of the existence among domestic animals of the State of any malignant diseases, to go at once to the place where such disease is alleged to exist and make a careful examination of the animals believed to be affected with any such disease, and ascertain, if possible, what, if any, disease exists among the stock reported to be affected, and establish quarantine, sanitary, and police regulations necessary to circumscribe and exterminate such disease; also to list and describe the domestic animals affected with such disease, and those that have been exposed thereto and included within the infected district or premises so defined and quarantined, with such reasonable certainty as would lead to their identification, and for that purpose he may, in his discretion, cause live stock so included within the quarantine lines established to be marked or branded in such manner as may be designated, and no domestic animals liable to become infected with the disease, or capable of communicating the same, shall be permitted to enter or leave the district, premises, or grounds so quarantined, except by the authority of the deputy State veterinarian. The deputy State veterinary surgeon shall also from time to time give and enforce such directions and prescribe such rules and regulations as to separating, modes of handling, treating, feeding, and care of such diseased and exposed animals as he shall deem necessary to prevent two classes of animals from coming in contact with each other and perfectly isolate from other domestic animals which have not been exposed thereto, and which are susceptible of becoming infected with the disease, and the said veterinarian or his agents are hereby authorized and empowered to enter upon any grounds or premises to carry out the provisions of this act.

Destroying infected animals. SEC. 6. When, in the opinion of the deputy State veterinarian, it shall be necessary, to prevent the further spread of any contagious or infectious disease among the live stock of the State, to destroy animals infected with, or which have been exposed to, any such disease, he shall determine what animals shall be killed or quarantined, and, when killed, the carcasses disposed of as, in his judgment, will best protect the health of the domestic animals of the locality.

Labor and supplies for deputy. SEC. 7. The deputy State veterinarian provided for in this act shall have power to employ at the expense of the State such persons, and purchase such supplies and material, as may be necessary to carry into effect all orders by him given as hereinbefore provided: *Provided*, That no labor shall be employed, nor labor, material, or supplies purchased, by the deputy State veterinarian, except such labor and material as may be necessary to carry into effect the experimentation, quarantine, and other regulations.

Owners to report outbreaks. SEC. 8. It shall be the duty of any owner or person in charge of any domestic animals who discovers, suspects, or has reason to believe that any of his domestic animals or domestic animals in his charge are affected with any contagious or infectious disease to report such fact, belief, or suspicion to the deputy State veterinarian; and it shall be the duty of any person who discovers the existence of any contagious or infectious disease among the domestic animals of another to report the same at once to the deputy State veterinarian.

Importing infected animals. SEC. 9. Any person who shall knowingly bring into this State any domestic animal which is affected with any contagious or infectious disease shall be deemed guilty of a misdemeanor, and upon conviction shall be fined in any sum not less than one hundred dollars ($100) nor more than two thousand dollars ($2,000).

Owners must allow examination. SEC. 10. Any person who owns or is in possession of live stock which is suspected or reported to be affected with any infectious or contagious disease who shall refuse to allow the deputy State veterinarian or any authorized officer or officers, in any examination of, or in any attempt to examine, such stock, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than fifty dollars ($50) nor more than two hundred dollars ($200).

Allowing infected animals at large. SEC. 11. Any person who shall have in his possession any domestic animal affected with any contagious or infectious disease, knowing such animal to be so affected, or after having received notice that such animal is affected, who shall permit such animal to run at large, or who shall keep such animal where other domestic animals not affected or previously exposed to such disease may be exposed to its contagion or infection, or who shall sell, ship, drive, trade, or give away such diseased animal or animals which have been exposed to such infection or contagion, or who shall move or drive away any domestic animal in violation of any direction, rule, or order establishing and regulating quarantine, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than fifty dollars ($50) nor more than two hundred dollars ($200) for each of such diseased or exposed animals which he shall permit to run at large, or keep, or drive, trade, or give away in violation of the provisions of this act: *Provided*, That any owner of domestic animals which have been affected with or exposed to any contagious or infectious disease may dispose of the same after having obtained from the State veterinarian a bill of health for such animal.

Importation may be prohibited. SEC. 12. Whenever the governor of the State shall have good reason to believe that any dangerous, contagious, or infectious disease has been epizootic in certain localities in other States or Territories or countries, or that there are conditions which render domestic animals from such infected districts liable to convey such disease, he shall by proclamation prohibit the transportation of any live stock of the kind diseased into the State, except under such rules and regulations as may from time to time be prescribed by the State veterinarian, with approval of the governor.

Deputy may call on county officers. SEC. 13. The deputy State veterinarian shall have power to call upon any sheriff, deputy sheriff, or constable to execute his orders, and such officers shall obey the orders of the deputy State veterinarian, and the officers performing such duties as provided for by the act shall receive compensation therefor, [as] prescribed by law for like services, to be paid as other expenses are paid, and any officer may arrest without a warrant and take before any magistrate of the county and hold until a warrant can be issued any person found violating the provisions of this act, and such officer shall immediately notify the county attorney of such arrest, and he shall prosecute the person offending according to the law.

General penalty. SEC. 14. Except as otherwise provided in this act, any person who shall violate, disregard, or evade, or attempt to violate, disregard, or evade any of the provisions of this act, or who shall violate, disregard, or evade any of the rules, regulations, orders, or directions of the deputy State veterinarian, establishing and governing quarantine, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than fifty dollars ($50) nor more than two hundred dollars ($200).

Deputy may administer oaths. SEC. 15. For the purpose of this act the deputy State veterinarian is hereby authorized to administer oaths and affirmations.

Cooperation with the Government. SEC. 16. That the deputy State veterinarian be authorized and directed to cooperate with the Secretary of Agriculture of the United States, or with any officer or authority of the General Government, in the suppression and extirpation of any and all contagious diseases among domestic animals and in the enforcement and execution of any and all acts of Congress to prevent the importation or exportation of diseased cattle and the spread of infectious or contagious diseases among domestic animals.

Office accommodation. SEC. 17. It shall be the duty of the board of public lands and buildings to provide for a suitable office for the said deputy State veterinarian and his assistants in the capitol building at Lincoln.

Repealing clause. SEC. 18. That sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, and 27, article 11, chapter 4, Compiled Statutes of Nebraska, entitled "State veterinarian—live stock agents," be, and the same are hereby, repealed.

Approved, March 30, 1901.

AN ACT To amend section 75 and section 78 of the criminal code of the State of Nebraska, and to repeal said original sections.

Be it enacted by the Legislature of the State of Nebraska:

SECTION 1. That section seventy-five of the Criminal Code of the State of Nebraska be amended so as to read as follows:

Disposing of infected sheep. "SEC. 75. Any person, being the owner of sheep or having the same in charge, who shall turn out or suffer any sheep having any contagious disease, knowing the same to be so diseased, to run at large upon any common, highway, or enclosed ground, or who shall sell any such sheep, knowing the same to be diseased, without fully disclosing the fact to the purchaser, shall be punished by a fine of not less than twenty dollars ($20) and not more than one hundred dollars ($100), or be imprisoned in the jail of the county not exceeding three months, in the discretion of the court: *Provided, however*, This section shall not be so construed as to prevent any person owning such diseased sheep from driving them along any public highway."

SEC. 2. That section seventy-eight of the Criminal Code of the State of Nebraska be amended so as to read as follows:

Wrongful taking of stock. "SEC. 78. If any person shall wrongfully take any horse, mare, gelding, foal, or filly, ass, or mule from the stable, lot, or pasture of another or from a hitching rack, or any other place as aforesaid, having been lawfully placed, without the consent of the owner, with intent to injure, set at large, or wrongfully use the animal so taken, such person shall be fined in any sum not exceeding one hundred dollars ($100) or be imprisoned in the county jail not exceeding three months, in the discretion of the court; and shall also be liable to the party injured in double the amount of damages sustained."

Repealing clause. SEC. 3. That sections seventy-five and seventy-eight of the Criminal Code of the State of Nebraska as heretofore existing be, and the same are hereby, repealed: *Provided, however*, That such repeal shall not be construed to apply to any offenses committed prior to the taking effect of this act, nor shall the same affect any convictions or prosecutions under either of said original sections.

Emergency clause. SEC. 4. Whereas an emergency exists, this act shall be in force and take effect after its passage and approval.

Approved, March 29, 1901

NEW JERSEY.

A further supplement to the act entitled "An act concerning contagious and infectious diseases among animals and to repeal certain acts relating thereto," approved May 4, 1886.

Be it enacted by the Senate and General Assembly of the State of New Jersey:

1. The fifth section of the act entitled "A further supplement to the act entitled 'An act concerning contagious and infectious diseases among animals and to repeal certain acts relating thereto,' approved May fourth, eighteen hundred and eighty-six," which further supplement was approved March twenty-eighth, eighteen hundred and ninety-five, and which said section five was amended by the one hundred and forty-eighth chapter of the laws of the year eighteen hundred and ninety-eight, be, and the same is hereby, amended to read as follows:

Increase of appropriation. "5. There may be appropriated to the State tuberculosis commission the sum of fifteen thousand dollars ($15,000) for defraying its expenses and for the payment of the proportion of the appraised value of slaughtered animals under this act, all which payments shall be made and expenses defrayed by the treasurer of this State upon the warrant of the State comptroller: *Provided*, That no payments shall be made pursuant to this act until the amount thereof shall have been included in the annual appropriation bill."

2. This act shall take effect immediately.

Approved, March 20, 1901.

NEVADA.

AN ACT To repeal an act entitled "An act providing for the appointment of a State live stock inspector, defining his duties, and fixing his compensation," which became a law March 22, 1899.

The people of the State of Nevada, represented in Senate and Assembly, do enact as follows:

Law of 1899 repealed. SECTION 1. The act of the legislature of the State of Nevada entitled "An act providing for the appointment of a State live stock inspector, defining his duties, and fixing his compensation," which became a law March 22, 1899, is hereby repealed.

Approved, March 12, 1901

AN ACT To amend section 1 of an act entitled "An act to prevent the dissemination of contagious diseases among sheep, to provide for the appointment of sheep inspectors in the several counties of this State, and to define their duties and compensation," approved February 23, 1893.

The people of the State of Nevada, represented in Senate and Assembly, do enact as follows:

Section 1 of said act is hereby amended so as to read as follows:

Sheep inspectors. "SECTION 1. It is hereby made the duty of the several boards of county commissioners in this State, at their first regular meeting in April, nineteen hundred and one, and annually thereafter, to appoint an inspector of sheep for each of the counties of this State, who shall reside in the county for which he is appointed. Each inspector so appointed, before entering upon the duties of his office, shall take his oath of office, and give an undertaking to the people of the State of Nevada, for the use of the respective counties thereof, with two or more sureties, to be approved by the board of county commissioners, conditioned for the faithful performance of his duties, and in such sum as the county commissioners of the several counties may deem sufficient for the faithful performance of the duties of his office and the enforcement of the requirements of this act."

Approved, March 14, 1901.

AN ACT Supplemental to an act entitled "An act to amend an act entitled 'An act to prevent the dissemination of contagious diseases among sheep, to provide for the appointment of sheep inspectors in the several counties of this State, and to define their duties and compensation,' approved February 23, 1893," approved March 6, 1899.

The people of the State of Nevada, represented in Senate and Assembly, do enact as follows:

Inspection fees. SECTION 1. The inspector of sheep in any county of this State where sheep are inspected shall collect the fees for such inspection in two annual installments; the first installment to be paid prior to the thirtieth day of June, and the second installment to be paid prior to the thirty-first day of December of each year.

Compulsory dipping. SEC. 2. It is hereby made compulsory on the part of any person or persons owning or controlling sheep in this State, between the first day of July and the first day of December in each year, where scab is visible, to dip the infected sheep twice at intervals of from ten to fourteen days.

Bringing sheep into the State. SEC. 3. Any person or persons owning or controlling sheep, and driving or bringing them into this State from any State shall, without delay, on entering this State, notify the nearest sheep inspector of their presence, with sheep, within this State.

Powers of inspectors. SEC. 4. The sheep inspectors of the several counties of this State are hereby authorized, empowered, and instructed that, on the neglect or refusal of any person or persons owning or controlling sheep to comply with the provisions of this act in respect to the dipping of infected sheep, to dip, or cause to be dipped, said infected sheep, the expenses of which shall be a charge against the band of sheep so infected, and unless the claim or demand is otherwise liquidated, the sheep inspector shall sell to the highest bidder a sufficient number of sheep from out the infected band to satisfy the claim.

Approved March 21, 1901.

NEW MEXICO.

AN ACT Relating to the licensing of dogs.

Be it enacted by the Legislative Assembly of the Territory of New Mexico:

* * * * * * *

SECTION 3. It shall be unlawful for any person to keep any dog known to be vicious and liable to attack and injure human beings, unless such dog is securely kept so as to prevent injury to any person; and it shall be unlawful to keep any dog which may have shown any symptom of madness or rabies.

SEC. 4. It shall be the duty of all persons who may be the owner or keeper of any such dogs, the keeping of which is declared to be unlawful, to cause such dog to be killed, and any failure to comply with this provision of this section after knowledge by the owner or keeper of the fact, which rendered such keeping unlawful, shall subject such owner or keeper to a fine of ten dollars ($10) and costs, and each day's failure to comply with the law may be held a separate offense.

* * * * * * *

Sec. 7. All of said municipal corporations are authorized to provide for the enforcement of this act by ordinance.

Sec. 8. All acts or parts of acts conflicting with this act are hereby repealed, and this act shall be in force and effect from and after its passage.

Approved March 21, 1901.

NEW YORK.

AN ACT To amend the agricultural law relative to diseases of domestic animals; to repeal article 4 of the public health law and incorporate in its stead certain provisions of the agricultural law relating to the public health, and making an appropriation to carry out the provisions of this act

The people of the State of New York represented in Senate and Assembly do enact as follows:

Section 1. Article four of chapter three hundred and thirty-eight of the laws of eighteen hundred and ninety-three, entitled "An act in relation to agriculture, constituting articles one, two, three, four, and five of chapter thirty-three of the general laws," as amended by chapter four hundred ninety-one of the laws of eighteen hundred ninety-eight, and chapter one hundred eighteen of the laws of nineteen hundred, is hereby amended to read as follows:

"Article IV.—*Diseases of domestic animals.*

Suppression of infectious and contagious disease.

"Sec. 60. Whenever any infectious or contagious disease affecting domestic animals shall exist, be brought into, or break out in this State, the commissioner of agriculture shall take measures to promptly suppress the same and to prevent such disease from spreading. The local boards of health shall notify the commissioner of the existence of infectious or contagious disease affecting domestic animals in the districts subject to their jurisdiction.

Commissioner to issue notice.

"Sec. 61. He shall issue and publish a notice stating that a specified infectious or contagious disease exists in any designated county or other geographical district of the State, and warning all persons to seclude in the premises where they may be at the time all animals within such county or district that are of a kind susceptible to contract such disease, and ordering all persons to take such precaution against the spreading of the disease as the nature thereof may in his judgment render necessary or expedient, and which he may specify in such notice. Such notice shall be published in such newspapers and be posted in such manner as the commissioner may designate and as in his judgment are most likely to give notice thereof.

Farms to be quarantined; inspection of premises.

"Sec. 62. The commissioner or an assistant commissioner shall order any premises, farm, or farms where such disease exists or recently existed to be put in quarantine, so that no domestic animal be removed from or brought to the premises or places quarantined, and shall prescribe such regulations as he may judge necessary or expedient to prevent the communication of the disease by infection or contagion in any way from the places so quarantined. The commissioner may adopt and enforce rules regulating the sanitation of stables and other buildings used for the stabling of cattle for the purpose of preventing the existence and spread of infection and contagion among cattle. He may provide for the inspection and examination of all such stables and buildings.

Detention and destruction of animals.

"Sec. 63. The commissioner or an assistant commissioner may order all or any animals coming into the State to be detained at any place or places for the purpose of inspection and examination. He may prescribe regulations for the destruction of animals affected with infectious or contagious disease, and for the proper disposal of their hides and carcasses and of all objects which might carry infection and contagion. Whenever in his judgment necessary for the more speedy and economical suppression or prevention of the spread of any such disease, he may cause to be slaughtered, and to be afterward disposed of in such manner as he may deem expedient, any animal or animals which, by contact or association with diseased animals or by other exposure to infection or contagion, may be considered or suspected to be liable to contract or communicate the disease sought to be suppressed or prevented. The commissioner may direct that an animal shall be condemned, quarantined, or slaughtered as tuberculous, under the provisions of this article, if it shall be found to be tuberculous by a physical examination. If the owner of animals suspected of being tuberculous desires to have such animals tested with tuberculin, and enters into a written agreement with the State in the manner prescribed by the commissioner of agriculture, before such test is made, to the effect that he will disinfect his premises, and either consent to the slaughter of the animals responding to such test, or hold them and their products in strict quarantine pursuant to the directions of the commissioner of agriculture, such test shall be made by a medical or veterinary practitioner designated by the commissioner. The commissioner may also, in his discretion, order such tuberculin test to be made, and if the animal responds to such test he may cause such animal to be slaughtered or held in strict quarantine.

Employment of veterinary surgeons. "SEC. 64. The commissioner may employ such and so many medical and veterinary practitioners, and such other persons as he may, from time to time, deem necessary to assist him in discharging the duties imposed upon him by this article, and may fix their compensation to the amount appropriated therefor. No animal shall be destroyed by the commissioner, or by his order, on the ground that it is a diseased animal, unless first examined by a medical or veterinary practitioner in the employ of the commissioner, nor until such practitioner renders a certificate to the effect that he has made such examination, that in his judgment such animal is affected with a specified infectious or contagious disease, or that its destruction is necessary in order to suppress or aid in suppressing such disease, or to prevent such disease, or prevent the spread thereof, specifying the reasons for such necessity.

Regulations and the enforcement thereof. "SEC. 65. The commissioner may prescribe such regulations as in his judgment may be thought suited for the suppression or prevention of the spread of any such disease, and for the disinfection of all premises, buildings, railway cars, vessels, and other objects from or by means of which infection or contagion may take place or be conveyed. He may alter or modify, from time to time, as he may deem expedient, the terms of all notices, orders, and regulations issued or made by him, and may at any time cancel or withdraw the same. He may call upon the sheriff or deputy sheriff to carry out and enforce the provisions of any notice, order, or regulation which he may make, and all such sheriffs and deputy sheriffs shall obey and observe all orders and instructions which they may receive from him in the premises. If the commissioner shall quarantine any particular district or territory for the purpose of stopping or preventing the spread of the disease known as rabies, and if any dog be found loose within the said quarantine district in violation of said quarantine or regulations, any person may kill or cause to be killed such dog, and shall not be held liable for damages for such killing.

Penalties. "SEC. 66. Any person violating, disobeying, or disregarding the terms of any notice, order, or regulation issued or prescribed by the commissioner under this article shall forfeit to the people of the State the sum of one hundred dollars ($100) for every such violation.

Appraiser of condemned animals. "SEC. 67. The commissioner of agriculture may appoint and at pleasure remove not more than three State appraisers of condemned animals. The persons so appointed shall be persons of experience and well acquainted with the value of farm animals. They shall receive five dollars ($5) per day for the time actually employed by order of the commissioner and all necessary traveling and other expenses incurred in the performance of their duties.

Appraisal of diseased animals. "SEC. 68. One of the State appraisers of condemned animals shall be present at the examination of all diseased animals, when such examination is conducted under this act, for the purpose of determining whether such animals should be slaughtered. Such appraiser shall determine the value of each animal directed to be slaughtered. Such value shall be the market value of such animals at the time of making such examination as though the animal were not diseased, but the appraisal value of each head of cattle shall not exceed the sum of sixty dollars ($60) if a thoroughbred and forty dollars ($40) if a grade. If the value of the condemned animals determined by the appraiser is not satisfactory to the owner of such animals, the value shall be determined by arbitrators—one to be appointed by the State appraiser and one by the owner of the animals. If such arbitrators are not able to agree as to the value of the animals, a third arbitrator shall be appointed by them. The value determined by such arbitrator shall be final. The costs and expenses of the proceedings before the arbitrators shall be paid by the owner of the animals. No cattle claimed to be thoroughbred shall be appraised as such unless the owner thereof shall furnish to the State appraiser a duly executed certificate of registry. Such appraiser of condemned animals and the arbitrators appointed under this section may administer oaths to and examine witnesses.

Certificate of appraisal. "SEC. 69. The appraiser shall execute and deliver to the owner of the condemned animals a certificate verified by him stating the appraised value of such animals. If such value was determined by arbitrators, there shall be attached to such certificate a statement of the value so determined, signed and verified by at least two of the arbitrators. The form and contents of such certificate shall be prescribed by the commissioner of agriculture.

Postmortem examination of slaughtered animals. "SEC. 70. All animals suspected of being tuberculous and slaughtered therefor shall be examined by a veterinary or medical practitioner, designated by the commissioner, for the purpose of determining whether or not such disease existed in such animals. There shall be attached to the certificate of appraisal a statement of the result of such examination, describing the animals found to be tuberculous and those which were found not to be tuberculous. The form of such statement shall be prescribed by the commissioner of agriculture. Such statement shall be verified by the veterinary or medical practitioner making the examination.

Compensation to owners of animals destroyed. "SEC. 70a. The actual appraised value at the time they are killed of all animals slaughtered under the provisions of this article, which shall be found upon a postmortem examination not to have had the disease for which they were slaughtered, unless the same were killed on account of the violation of quarantine regulations, shall be paid to the owners of such animals. The certificate of appraisal, the statement of the result of the postmortem examination, shall be presented by the owner or his legal representatives or assigns, to the commissioner of agriculture. The commissioner of agriculture shall issue his order for the amount due as shown by such certificate and statement, which shall be paid by the State treasurer on the warrant of the comptroller out of moneys appropriated therefor. The board of claims shall have exclusive jurisdiction to hear, audit, and determine all claims which shall arise under the provisions of this article for compensation for animals slaughtered and to allow thereon such sums as should be paid by the State. No compensation shall be made to any person who has wilfully concealed the existence of disease among his animals or upon his premises, or who in any way by act or by wilfull neglect has contributed to spread the disease sought to be suppressed or prevented, nor for any animal which upon a postmortem examination is found to have the disease on account of which it was slaughtered or any dangerously contagious or infectious disease that would warrant the destruction of such animal.

Expenses. "SEC. 70b. All expenses incurred by the commissioner in carrying out the provisions of this article and in performing the duties herein devolved upon him shall be audited by the comptroller as extraordinary expenses of the department of agriculture, and paid out of any moneys in the treasury appropriated for such purposes.

Federal regulations. "SEC. 70c. The commissioner of agriculture may accept, in behalf of the State, the rules and regulations prepared and adopted by the commissioner of agriculture or the Secretary or Department of Agriculture of the United States under any act of Congress for the establishment of a Bureau of Animal Industry, or to prevent the exportation of diseased cattle, or to provide means for the extirpation and suppression of pleuro-pneumonia and other contagious diseases among domestic ahimals, and shall cooperate with the authorities of the United States in the enforcement of the provisions of any such act.

Rights of Federal inspectors. "SEC. 70d. The inspectors of the Bureau of Animal Industry of the United States shall have the right of inspection, quarantine, and condemnation of animals affected with any contagious, infectious, or communicable disease, or suspected to be so affected, or that may have been exposed to any such disease, and for such purposes they may enter upon any ground or premises; they may call the sheriffs, constables, and peace officers to assist them in discharge of their duties in carrying out the provisions of any such act; and all sheriffs, constables, and peace officers shall assist such inspectors when so requested, and such inspectors shall have the same powers and protection as peace officers while engaged in the discharge of their duties. All animals entering the State which pass inspection by the Federal authorities shall be permitted to proceed to place of destination without further inspection under this act. This State shall not be liable for any damages or expenses caused or made by such inspectors."

Repealing clause. SEC. 2. Article four of chapter six hundred and sixty-one of the laws of eighteen hundred and ninety-three, entitled "An act in relation to the public health, constituting chapter twenty-five of the general laws," as amended by chapter six hundred and seventy-four of the laws of eighteen hundred and ninety-four and chapter ten hundred and thirteen of the laws of eighteen hundred and ninety-five, is hereby repealed.

Appropriation. SEC. 3. The sum of ten thousand dollars ($10,000), or so much thereof as may be necessary, is hereby appropriated, out of any moneys in the treasury not otherwise appropriated, for the purposes of this act.

SEC. 4. This act shall take effect immediately.

Approved, April 11, 1901.

NORTH DAKOTA.

AN ACT **Authorizing the county commissioners to build and equip dipping tanks at county expense.**

Be it enacted by the Legislative Assembly of the State of North Dakota:

Dipping tanks. SECTION 1. The county commissioners of each county may, upon the petition of fifty electors and freeholders of such county, cause to be built and equipped at the principal shipping point for live stock in said county a public dipping tank, where all the live stock of such county may be dipped as a preventative of contagious, infectious, and epidemic diseases.

Plans and specifications. SEC. 2. The State veterinarians shall furnish each board of county commissioners with plans and specifications for the construction of such dipping tank whenever the commissioners shall have been petitioned as herein provided. It shall also be the duty of the State veterinarian to furnish rules and regulations necessary for the proper use of such dipping tanks by the owners of stock in their respective counties.

Expense. SEC. 3. The expense of building dipping tanks under the provisions of this act shall be paid out of the general fund of the county wherein such tank shall be built.

Emergency. SEC. 4. Whereas there will be a large number of cattle and sheep shipped into this State before July 1st next, it is important that they be dipped to prevent the introduction of disease, therefore this act shall take effect from and after its passage and approval.

Approved, March 13, 1901.

AN ACT **To amend and reenact sections 1636 and 1636a of the revised codes of the revision of 1899.**

Be it enacted by the Legislative Assembly of the State of North Dakota:

SECTION 1. That sections 1636 and 1636a of the revised codes of the revision of 1899 be, and the same are hereby, amended and reenacted to read as follows:

Powers of inspectors. "SEC. 1636. That five days' notice shall be given to the sheep inspectors by persons intending to bring sheep into any county in this State from another State for the purpose of grazing said sheep upon lands in this State, which notice shall state the place where such sheep are located and the nearest place to the line where the said sheep may be inspected. In all cases where scab or other contagious diseases are found in a flock of sheep the sheep inspector is hereby empowered to prescribe what dip or remedy shall be applied and specify the manner of treatment.

Duties of inspectors. "SEC. 1636a. It is hereby made the duty of sheep inspectors of this State to cause to be dipped all sheep that come into the State for the purpose of running upon or grazing on the lands of this State, which dipping shall be done under such rules and regulations as the sheep inspector may prescribe. And after said dipping the said inspector shall cause the sheep so dipped to be quarantined for not less than twenty days, or until the said sheep inspector shall be satisfied that the said sheep are entirely free from disease; provided, that this section shall not apply to sheep while on railway cars or in railway stock yards, accompanied by proper certificates of health, and which sheep are not detained in the State more than sixty hours."

SEC. 2. All acts and parts of acts in conflict with the provisions of this act are hereby specifically repealed.

Emergency. SEC. 3. Whereas the present laws of this State are vague and indefinite as to the duties of the sheep inspector in the cases herein provided, and said laws are capable of working great damage to the residents of this State, therefore an emergency exists, and this act shall take effect and be in force immediately upon its passage and approval.

Approved March 12, 1901.

OKLAHOMA

AN ACT To provide for the protection of domestic animals, for the creation of a live-stock sanitary commission, rules and regulations, to provide penalties for violation of the same, and to repeal chapter 50 of the session laws of the Territory of Oklahoma for the year 1895.

Be it enacted by the Legislative Assembly of the Territory of Oklahoma:

Live-stock sanitary commission. SECTION 1. [As amended March 7, 1901.] That immediately upon the taking effect of this act the governor of the Territory of Oklahoma, by and with the advice and consent of the council, shall appoint three competent persons, residents of the Territory of Oklahoma, who shall hold their office for two years and until their successors are appointed, to constitute the live-stock sanitary commission of the Territory of Oklahoma. Whenever a vacancy in the membership of such commission shall occur, by reason of death, resignation, expiration of term, or removal from office, or otherwise, the governor shall appoint a successor, who shall be qualified under the provisions of this act.

Qualifications of members. SEC. 2. [Law of 1901.] Not more than two of the members of said commission shall be of the same political party, and at least two of said commission shall be cattlemen or persons of experience in cattle business.

Salaries. SEC. 3. [Law of 1901.] The members of said live-stock sanitary commission shall receive for their services while attending meetings of the commission the sum of three dollars ($3) per day and three (3) cents per mile for distance necessarily and actually traveled in attending such meetings. One member of said commission shall be appointed secretary of said commission, who shall be the executive officer of the board and shall receive a salary of one hundred dollars ($100) a month, but the secretary shall receive no per diem; the said secretary shall also receive the actual and necessary expenses of his office, not exceeding for any one year the sum of two hundred dollars ($200), said salary and expenses and per diem to be paid out of any money in the Territorial treasury not otherwise appropriated.

One inspector must be a veterinarian. SEC. 4. [Law of 1901.] One of the inspectors appointed by the live-stock sanitary commission under the provisions of the act of which this act is amendatory shall be a qualified veterinarian and a graduate of some recognized veterinary college.

Meetings of commission. SEC. 2. [As amended March 7, 1901.] A majority of the members of said commission shall constitute a quorum for the transaction of business. Said commission shall meet at any place in the Territory when necessary and may meet at various times, not to exceed thirty days in any one year, and said commission shall be paid out of the Territorial treasury, upon warrants drawn by the Territorial auditor, on the vouchers of said board.

Duties of commission. SEC. 3. [As amended March 7, 1901.] It shall be the duty of the commission provided for in the first section of this act to protect, as far as practicable, the live stock of this Territory from all contagious or infectious diseases of a malignant character, whether said diseases exist in this Territory or elsewhere, and for this purpose they are hereby authorized and empowered to establish, maintain, and enforce such quarantine lines and lines established by law, and to make all reasonable and necessary sanitary rules and regulations, and to provide rules and regulations for the enforcement and execution of the same, and to prevent the importation and exportation of diseased live stock and the spread of infectious and contagious diseases among domestic animals. It shall also be the duty of said commission to cooperate with the live-stock sanitary commissioners, boards, and officers of other States and Territories and with the United States Secretary of Agriculture in establishing such quarantine lines, rules, and regulations as shall in their judgment best protect the live-stock industry of this Territory against contagious or infectious diseases of a malignant character, said rules to be uniform with those of the Secretary of Agriculture of the United States in regard to the prohibited period when it shall be unlawful to cross the quarantine lines established by the Secretary of Agriculture and by this act; and they are hereby empowered and authorized to make a thorough investigation as to the best manner of disinfecting animals, pens, shipping pens, and railway cars that are liable to communicate or convey contagious or infectious diseases of a malignant character to live stock, and to adopt such rules and regulations to enforce their disinfection as they may deem necessary.

That the quarantine line of the Territory of Oklahoma is established as follows, to wit: Commencing at a point where the Arkansas River crosses the Kansas State line; thence south along the Arkansas River to the northeast corner of the Ponca Indian Reservation; thence west along the north boundary line of the Ponca Indian Reservation to the main line of the railroad track of the Atchison, Topeka and Santa Fe Railroad Company; thence south on said main track to the Salt Fork of the Arkansas River; thence down said river to a point where the same empties into the Arkansas River; thence down the west bank of the Arkansas River to the line between the Ponca Indian Reservation and the Otoe and Missouria Indian Reservation; thence west on said line between the Ponca Indian Reservation and the Otoe and Missouria Indian Reservation to the main track of the Atchison, Topeka and Santa Fe Railway Company; thence down said main track to the south line of the said Otoe and Missouria Indian Reservation; thence east on a line between Noble County and said reservation to the southeast corner of said reservation; thence north on a line between said reservation and Pawnee County to the Arkansas River; thence down said river to the north boundary line of the Creek Nation; thence west along the line between the Creek Nation and the Territory of Oklahoma to the northwest corner of the Creek Nation; thence south on a line between the Creek Nation and the Territory of Oklahoma to the southeast corner of Lincoln County; thence west on a line between Lincoln County and Pottawatomie County to the northwest corner of Pottawatomie County; thence south on a line between Pottawatomie County and Oklahoma and Cleveland counties to the township line between townships seven and eight north; thence west on said line to the South Canadian River; thence westerly up said river, along the meanders of said river, to the northeast corner of the Wichita Indian Reservation; thence up said river to the northwest corner of the Wichita Reservation; thence south along a line between the Wichita Reservation and Custer County and Washita County to the southeast corner of Washita County; thence west along the line between Washita County and the Kiowa and Comanche Reservation to the North Fork of the Red River; thence down and along said North Fork of the Red River to a point of confluence with the Red River; thence up said Red River to a point where said Red River is intersected by the United States quarantine line: *Provided, however,* That the said commission may, in its discretion, establish subquarantine lines as in their judgment will best protect the people in the Kiowa and Comanche, Apache, and Wichita Indian reservations, and may, in its discretion, establish a temporary line as far south as the Red River; but it shall not be empowered to change or affect the permanent line established herein to in any manner affect the people living north of said permanent line along said reservations: *Provided,* Such cattle, if found to be healthy and free from infection upon inspection, shall be permitted to cross the Territorial quarantine line and be brought into this Territory between December first and February first of each year and at such other time as the live-stock sanitary commission of Oklahoma may order under its rules: *Provided further,* This section shall not authorize the transportation of such cattle across the Federal quarantine line.

The inspector of the district shall be removed from office if he delays any such inspection longer than is necessary: *Provided,* That if any sheriff or inspector shall be guilty of malfeasance in office, claiming authority under the quarantine laws of this Territory, he shall be civilly liable for all damage done by reason of such malfeasance.

Governor to proclaim line. SEC. 4. When said commission shall have determined quarantine lines and made rules and regulations to maintain and enforce the same to prevent the communicating or conveying of contagious or infectious diseases of a malignant character to live stock within this Territory as heretofore provided, the governor of the Territory of Oklahoma, whenever advised and directed by said commission, shall issue his proclamation setting forth and proclaiming the boundary and location of said quarantine line or lines, the orders, rules, and regulations so prescribed by said commission, and the issuance of said proclamation shall be due and public notice of its provisions, and no further notice or publication of the same shall be necessary.

Districts. SEC. 5. The said live-stock sanitary commission shall divide the Territory of Oklahoma into three separate districts and define the boundaries thereof, and shall assign the inspectors appointed under this act, one to each respective district. Said inspectors shall have power to act throughout the Territory, and it shall be their duty to communicate any information or aid in any manner the inspectors of the other districts in the performance of their duties. Each inspector shall have a fixed or permanent address within his district, which said address, together with the boundaries of his district and the full name of the inspectors, shall be published in the proclamation of the governor, as hereinbefore provided.

Inspectors. SEC. 6. There shall be appointed by said commission three live-stock inspectors, one of same from each one of the three political parties of this Territory, one to be a Democrat, one a member of the People's Party, or Populist, and one a Republican, and should the place of any inspector be made vacant by death, resignation, or otherwise, his successor shall be appointed from the same political party of which he was a member. They shall be qualified and learned in the diseases of domestic animals, and shall first pass satisfactory examination before said commission. Said inspectors shall act under the orders and instructions of said commission, and shall [have] full power to execute the orders thereof and to do all things necessary to the enforcement and execution of the rules and regulations thereof, and the rules of the Secretary of Agriculture of the United States. They shall hold their office for the period of two years from the date of appointment, and subscribe to the oath of office, and give bond to the Territory of Oklahoma in the sum of one thousand dollars ($1,000) each for the faithful performance of all duties enjoined upon them by law or the live-stock sanitary commission. Said inspectors shall render all reports and accounts to said commission, and shall receive three dollars ($3) per day for the time employed in the discharge of their duties, and five hundred dollars ($500) a year, and no more, or so much thereof as is necessary for actual expenses incurred in the discharge of their duties, which said salary and expenses shall be paid out of the treasury of the Territory of Oklahoma on auditor's warrants issued upon the vouchers of said commission.

Powers of inspectors. SEC. 7. The inspectors appointed and acting under the provisions of this act shall have power to enter upon any premises, or into any barn, lot, corral, shed, or pasture for the purpose of inspecting or disinfection. If upon examination he is satisfied that said premises, barn, lot, corral, shed, or pasture is infected with any contagious or infectious disease of a malignant character, or needs disinfecting, he shall possess himself thereof and may exclude any and all persons from interference with his possession thereof, and establish such rules and regulations as he may deem necessary until he shall be satisfied that the same is free from such infection. Any person or persons who shall interfere with said inspector's possession of said premises, barn, lot, corral, shed, or pasture, or violate any of the rules and regulations made by him for the protection or disinfection of same, while the same is under his control or possession, shall be guilty of a misdemeanor, as provided in section 13 of this act.

Duties of inspectors. SEC. 8. It shall be the duty of the inspectors under this act to enforce all the provisions of this act, and the rules and regulations of the live-stock sanitary commission, and the rules and regulations of the Department of Agriculture of the United States thereunder. Whenever notified by the sheriff or any person that any live stock, pastures, barns, lots, corrals, sheds, or range are affected or infected with any contagious or infectious diseases of a malignant character, he shall at once proceed to the inspection of said live stock, pastures, barns, lots, corrals, sheds, or range, and if he shall consider the same affected or infected shall immediately establish rules and regulations governing the movement of said live stock or possession and use of said pastures, barns, lots, corrals, sheds, or range, or of the disinfection thereof, and if necessary shall place the same in possession of and under control of the sheriff, if he be not already in control.

Stock crossing line illegally. SEC. 9. If any live stock shall be led, drifted, driven, or transported across any quarantine line established by the Department of Agriculture of the United States, the live-stock sanitary commission of the Territory of Oklahoma, the quarantine line in the Territory of Oklahoma as herein established, or of the live-stock inspectors, into or upon any part of the Territory of Oklahoma protected by said quarantine lines, during the prohibited period as prescribed by the live-stock sanitary commission or its inspectors, or the laws of Congress, and the Territory of Oklahoma and the proclamation issued under authority thereof, the inspectors shall have the power to seize said live stock, and may call to their aid the sheriff of the county where said live stock is found, and shall either place same under quarantine regulations or return said live stock back across said line into the territory from whence they came, and the costs and charges of the sheriff, which shall be the same as in the case of personal property taken under execution, shall be a lien upon said live stock, and he may sell all or a part thereof to pay the same, as provided in section 10 of this act, and the person or persons who shall be in charge of said live stock, or shall have the same in their possession, shall be deemed guilty of a misdemeanor, and upon conviction shall be punished as provided in section 13 of this act.

Powers of sheriff. SEC. 10. It shall be the duty of any sheriff of any county within this Territory, upon a complaint made to him, or otherwise having notice or knowledge that there is within the county where the officer resides live stock believed to be affected or infected with a contagious or infectious disease of a malignant character and liable to communicate or convey the same to any live stock, or that any live stock has been driven, led, moved, shipped, or drifted, or in any manner transported into or through any portion of this Territory in violation of any rules, regulations, or orders of the live-stock sanitary commission, he shall immediately take charge of and restrain said live stock under such temporary regulations as will prevent the communicating or conveying of said disease, and he shall immediately notify the live-stock inspector of his district; and said sheriff shall keep said stock in his custody until the arrival of the live-stock inspector, who shall immediately take such steps as he may deem necessary for the protection of the live-stock interests of that locality. All live stock so seized by any sheriff shall be kept and held in his custody, subject to such quarantine regulations as he shall receive from said live-stock inspector, unless he shall receive further orders from the said live-stock inspector to deliver said live stock to the owner or owners. No officer who shall take or detain any live stock under the provisions of this act shall be liable to the owner or owners of such live stock for any damage by reason of such taking or detention, or by reason of the performance of any other duty enjoined in this act. Before any live stock shall be delivered as aforesaid, there shall be paid to the officer having said live stock in custody all costs and expenses of taking, detaining, or holding, or disinfecting, and in case such costs and expenses are not paid, said officer shall advertise in the same manner as provided by law in cases of the taking, caring for, and sale of personal property upon execution, and he may sell such live stock or such portion thereof as may be necessary to pay his costs and expenses of sale, and he shall forthwith pay over to the owner or owners any amount so received in excess of the legal fees and expenses of such officer.

Moving diseased stock. SEC. 11. Any person, persons, or corporation who shall drive, lead, move, drift, ship, transport, or cause to be driven, led, moved, drifted, shipped, or transported into or through any county or part thereof in this Territory within the area protected by and included within quarantine or boundary lines described by the live-stock sanitary commission, or one of the inspectors appointed thereby, any live stock affected or infected with a contagious or infectious disease of a malignant character, and liable to communicate or convey such disease to live stock within said area, shall be guilty of a misdemeanor, and upon conviction thereof shall be fined in the sum of not less than one hundred dollars ($100) nor more than five thousand dollars ($5,000), and may be imprisoned in the county jail not less than thirty days nor more than one year, or may be punished by both such fine and imprisonment, and in addition thereto shall be liable to any person or persons injured thereby for all damages they may sustain by reason of the communicating or conveying of such disease, to be recovered in a civil action in any court of competent jurisdiction, and the party so injured shall have a first and prior lien to all other liens for such damages upon the live stock communicating or conveying such disease: *Provided, however,* That nothing in this act shall be construed to effect [affect] the laws of Congress governing interstate commerce.

Disinfecting railroad cars. SEC. 12. It shall be the duty of the railway corporations doing business in this Territory, and they are hereby required, to disinfect the shipping pens and cars used by them in transporting live stock in or through this Territory, in such manner and at such times and places as the said commission may order and designate; and any such corporation violating any of the provisions of this section shall be liable to a penalty of not less than one hundred dollars ($100) and not more than five thousand dollars ($5,000) for each violation of any of said regulations or rules of said commission, to be recovered in a civil action to be prosecuted by the attorney-general, or under his direction, in the name of the Territory of Oklahoma, in the district court of Logan County, Territory of Oklahoma, or any county where such violation may have occurred.

Penalty for violation of quarantine laws. SEC. 13. Any person or corporation who shall, in violation of any of the rules, regulations, orders, or directions of the live-stock sanitary commission, or any of its live-stock inspectors, fixing, establishing, or maintaining quarantine lines or local quarantine rules and regulations within this Territory against contagious or infectious diseases of a malignant character, drive, lead, move, drift, ship, or in any manner transport any live stock across said lines or any of them, or violate any local quarantine rules and regulations, or in any manner interfere, interrupt, or obstruct the live-stock sanitary commission or any of its live-stock inspectors in the discharge of their duty, shall be guilty of a misdemeanor, and shall for each offense, upon conviction, be fined in the sum of not less than one hundred dollars ($100) nor more than one thousand dollars ($1,000), or be imprisoned in the county jail for not less than thirty days nor more than one year, or may be punished by both such fine and imprisonment, and shall be liable in a civil action for all damages caused by violation of this act.

Condemnation of stock and payment for same. SEC. 14. Whenever any live stock within this Territory shall be found by the live-stock inspectors to be affected with rinderpest, foot-and-mouth disease, glanders, maladie du coït, or contagious pleuropneumonia, he shall summon three disinterested householders and cause said stock so affected to be appraised, which appraisement shall be upon the value of the stock at that time. He shall then kill said stock and dispose of the carcasses thereof in such manner as will, in his judgment, best protect the health of the domestic animals of that locality. The inspector shall forward his report of animals killed, disease with which affected, name of owner, and the appraisers' certificate to the secretary of the live-stock sanitary commission. The said commission shall audit the account, if correct, and forward the voucher to the auditor of the Territory, who shall draw his warrant upon the Territorial treasurer for the amount, and who shall pay the same out of the general funds of said Territory: *Provided, however,* That if said stock contracted the disease from without the Territory, or if the owner thereof has violated any quarantine regulations of the Territory or of the United States Government, or if he became the owner thereof with the knowledge that said stock was affected with said disease, the Territory shall not be liable for the value thereof.

Criminal prosecutions. SEC. 15. It shall be the duty of the county attorney of the proper county to prosecute, on behalf of the Territory, all criminal cases arising under this act. For each conviction of an offense under this act said county attorney shall receive, in addition to his salary already provided, the sum of twenty-five dollars ($25), to be taxed as costs in the case.

Butchers to notify inspectors. SEC. 16. It shall be the duty of the inspectors provided for by this act to provide themselves with record books, in which they shall record age, brand, and color of all cattle slaughtered within their respective districts for the purpose of sale to the public, either wholesale or retail, and to appoint in each county of his district one or more deputies for the purpose of inspecting animals for slaughter, as provided for by this act, whenever he shall be requested to so appoint by a petition in writing signed by fifty qualified voters of said county. It shall be the duty of all persons slaughtering cattle for public sale and use to notify the inspector of the district or his local deputy appointed by him for that purpose of their intention so to do. The inspector or his deputy shall at once proceed to inspect said cattle; and if he shall find that they are affected or infected with any disease which will render them unfit for human food, he shall inform the person not to slaughter the same; but should such cattle be found to be free from all disease, then he shall record the color, age, and brands of same, and said cattle shall be considered fit for slaughter and sale. Any person offering the meat of cattle for sale without having them inspected as aforesaid shall be deemed guilty of a misdemeanor, and upon conviction thereof be fined ten dollars ($10) for every animal so unlawfully slaughtered. The inspectors or their deputies shall be entitled to a fee of twenty-five (25) cents for each head of cattle inspected, to be paid by the person having the same done.

Inspectors' weekly reports. SEC. 17. It is hereby made the duty of all inspectors in this Territory at the end of each week to transmit to the secretary of the live-stock sanitary commission a report showing in detail the number of animals inspected by him or his deputies during the week; the number rejected as being unfit for human food, with recommendations as to the disposition to be made of the same; the number of animals recommended as fit for slaughter, with a complete description of the marks and brands on each animal inspected, giving location of the same, and to give the person slaughtering the animal a duly certified health certificate with the description of the animal or animals found to be fit for human food, the certificate to contain all marks and brands upon said animal or animals.

Sheriffs to report violations. SEC. 18. It is hereby made the duty of all sheriffs in this Territory to at once make known to the county attorneys and to the grand juries of their respective counties any and all violations of any of the provisions of this act which may come to their knowledge and to said live-stock inspectors and other proper authorities of this Territory in the enforcement of the rules and regulations and orders of said commission and inspectors, and of any and all the provisions of this act; and all district judges are hereby required to give this act in charge to the grand juries of their respective counties at each term of the courts thereof.

Venue. SEC. 19. Any person who violates any of the provisions of this act as hereinbefore mentioned may be prosecuted in the county of his residence, or in any county in this Territory in which he may be found, or in any county in which any live stock owned or controlled by him may be found in violation of any of the provisions of this act, or in any county in which any violation of any provision of this act may be committed by him.

General penalty. SEC. 20. Except as otherwise provided for in this act, any person who shall violate, disregard, or evade, or attempt to violate, disregard, or evade, any of the provisions of this act, or who shall violate, disregard, or evade, or attempt to violate, disregard, or evade, any of the rules, regulations, directions, or orders of the live-stock sanitary commission or any of its live-stock inspectors shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in the sum of not less than one hundred ($100) nor more than five thousand dollars ($5,000), or be imprisoned in the county jail for not less than thirty days nor more than one year, or may be punished by both such fine and imprisonment.

Repeal of chapter 50. SEC. 21. That all of chapter 50 of the session laws of the Territory of Oklahoma for the year 1895 is hereby repealed.

SEC. 22. This act shall be in force and effect from and after its passage and approval.

Approved, March 9, 1897.

[Sections 1, 2, and 3, as amended and added to, approved March 7, 1901.]

OREGON.

AN ACT To create the office of State bacteriologist, without salary.

Be it enacted by the Legislative Assembly of the State of Oregon:

State bacteriologist. That the office of State bacteriologist, without salary, is hereby created, and that the governor of the State is hereby authorized to appoint a person properly qualified by scientific attainments to serve in that capacity. The duties of such officer shall be the scientific investigation of animal and plant diseases and recommendations of remedies for their elimination. He shall from time to time make a brief report of the progress of his work to the governor of the State.

Approved, February 27, 1901.

PENNSYLVANIA.

AN ACT To provide for the investigation of the diseases of domestic animals, and making an appropriation therefor.

Be it enacted, etc..

Appropriation. SECTION 1. That the sum of ten thousand dollars ($10,000), or so much thereof as may be necessary, be, and the same is hereby, specifically appropriated out of any money in the treasury not otherwise appropriated, for the purpose of conducting investigations concerning the causes, nature, treatment, and prevention of the diseases of the domestic animals of the Commonwealth of Pennsylvania, with the object of discovering new facts which may be applied advantageously and profitably by the owners of live stock and those engaged in the care and rearing of animals.

Method of investigation. SEC. 2. That such investigations shall be made by and under the direction of the State live-stock sanitary board, and the said board is hereby authorized to provide for and conduct such work of investigation as may be necessary to discover the most efficient, economical, and practical means of avoiding and suppressing the diseases of the domestic animals of the Commonwealth; and such work, and the practical deductions therefrom, shall, upon the order of the secretary of agriculture, be published as a part of the annual report of the department of agriculture, or as bulletins of said department: *Provided, however,* That before any expenses shall be incurred under the provisions of this act, it shall first be approved by the governor and the secretary of agriculture. The said appropriation is to be paid upon the warrant of the auditor-general, on the presentation of specifically itemized vouchers and the written approval of the governor and secretary of agriculture as herein provided.

Approved, July 18, 1901.

To provide for the prevention of the spread of disease from the carcasses of animals that die of dangerous or virulent diseases, or are killed while afflicted with such diseases; to provide for the safe disposal or destruction of such carcasses; to authorize the State live-stock sanitary board to make regulations for the enforcement of this act; to provide penalties for the violations of the act and of the regulations that may be made under it by the State live-stock sanitary board.

Be it enacted, etc.:

Diseased carcasses must be destroyed. SECTION 1. That when any domestic animal may die, or be killed while afflicted with an infectious, contagious, germ, or parasitic disease, adjudged by the State live-stock sanitary board to be of a dangerous or virulent character, and in particular when any domestic animal may die or be killed while it is afflicted with any one of the diseases known as anthrax, black quarter, hog cholera, swine plague, rabies, or glanders, the owner or owners of such animals shall at once destroy or dispose of the carcass of such animal by one of the methods herein provided.

Methods of destruction. SEC. 2. The methods of destruction or disposal shall be of a kind that will completely destroy or securely sequester the poison, germ, parasite, or infective agent of the disease with which the animal was afflicted at the time of death. The following methods of destruction or disposal shall be allowed: (1) Complete burning or cremation of the carcass and of all its parts and products. (2) Boiling the carcass and all of its parts and products in water, or heating the same with steam, at the temperature of boiling water, for at least two hours. (3) Burying the carcass and all of its parts and products in a place that is not subject to overflow from ponds or streams, that is distant not less than one hundred feet from any water course, well, spring, public highway, or building used as a house or stable, and in the following manner, to wit: The grave shall be of such a depth that when the carcass and parts and products thereof are placed in it, and the grave is filled with earth and the top is smoothed to the level of the surrounding surface, the uppermost part of the carcass and all of its parts and products shall be completely covered; and, further, the grave shall be so protected that the carcass can not be dug out or exposed by dogs or animals. Before the carcass and its parts and products are covered with earth they shall be covered with lime to a depth of not less than three inches. Any other method of destroying or disposing of carcasses, and of the parts and products of carcasses, may be practiced that is specifically approved by the State live-stock sanitary board.

Penalty for noncompliance. SEC. 3. If any person owning an animal that dies while it is afflicted with anthrax, black quarter, hog cholera, swine plague, rabies, or glanders, or any other infectious, contagious, germ, or parasitic disease that is adjudged by the State live-stock sanitary board to be of a dangerous or virulent character, shall, after notification by anyone, neglect within twenty-four hours to destroy or dispose of the carcass and its parts and products in accordance with the provisions of section two of this act, the said person shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not less than ten dollars ($10) nor more than one hundred dollars ($100), at the discretion of the court.

Failure to destroy diseased carcass. SEC. 4. When the carcass and products of any animal that died while afflicted with any of the diseases specified in section one of this act or of any infectious, contagious, germ, or parasitic disease adjudged by the State live-stock sanitary board to be of a dangerous or virulent character, is not disposed of or destroyed in one of the ways set forth in section two of the act, and this fact shall be brought to the attention of an agent of the State live-stock sanitary board, the board of health of the township, borough, or city in which the death occurs or in which the carcass of the animal may be; or when this fact shall be brought to the attention of any member of such board of health, or in the event that there is no board of health having jurisdiction, when any township's auditor, of a township in which such a carcass may be, is notified of the fact, it shall be the duty of the said agent of the State live-stock sanitary board or member of a board of health, or said health board, or said township auditor, to at once cause the carcass and its parts and products to be disposed of or destroyed in accordance with the methods prescribed in section two of this act.

The disposal or destruction of the carcass shall be carried out in a way that is as economical as is compatible with efficiency and safety, and a fully itemized bill of expense incurred shall be drawn up by the agent of the State live-stock sanitary board, the board of health, or the board of township auditors and forwarded as a voucher to the State live-stock sanitary board. If the voucher is approved by the said board, it shall be paid in the same manner as other expenses of said board are paid: *Provided, however*, That no charge shall be paid of more than ten dollars ($10) for the destruction of a single carcass of a horse, mule, cow, bull, or ox; nor more than three dollars ($3) for the destruction of a single carcass of a colt, calf, sheep, hog, or dog.

Owners must pay for destruction. SEC. 5. The cost of the destruction of the carcass or carcasses as hereinbefore provided shall constitute a lien on the property of the owner or owners of the animals at the time of their death, and it shall be the duty of the State live-stock sanitary board to attempt to recover, and if possible to recover, by due process of law, from said owner or owners, the amounts expended by it for disposing of or destroying the carcasses of their animals in the enforcement of this act.

Approved May 2, 1901.

SOUTH CAROLINA.

AN ACT To authorize and empower the board of trustees of Clemson College to promulgate and enforce rules and regulations for the guidance of the veterinarian of said college in the treatment or destruction of animals affected with contagious diseases.

Be it enacted by the General Assembly of the State of South Carolina:

Board of trustees may make rules. SECTION 1. That the board of trustees of Clemson College shall have the right to promulgate and enforce rules and regulations for the guidance of the veterinarian of said college, or his assistant, if one shall be appointed, in the treatment of horses, mules, cattle, hogs, or other live stock affected with any dangerous or contagious disease.

To prevent disease entering the State. SEC. 2. That the said board shall have the power to adopt rules and regulations, consistent with the laws of this State and of the United States, to prevent the introduction into this State of any live stock that is affected with any contagious disease the tendency of which is to cause the death of said live stock.

Unlawful to sell diseased animals. SEC. 3. It shall be unlawful to sell or offer for sale in this State any horse, mule, cattle, hog, or any other live stock that is known to be affected with any contagious disease the tendency of which is to cause the death of any such live stock; and any person or persons violating the provisions of this section shall be deemed guilty of a misdemeanor, and upon conviction shall be fined in a sum not exceeding one hundred dollars ($100), or be imprisoned in the county jail not exceeding thirty days.

Powers of veterinarian. SEC. 4. That the said veterinarian shall have the right to visit any section of this State where contagious diseases among animals is believed to exist, and shall determine, under the rules and regulations of the said board, whether such affected animals are worthy of remedial treatment or should be destroyed. It shall not be lawful for any person or persons to hinder or obstruct said veterinarian or his assistant in the enjoyment of the rights given by this section or in the discharge of the duties prescribed by this [the] next succeeding section; and any person or persons violating the provisions of this or the next succeeding section shall be guilty of a misdemeanor, and upon conviction shall be punished as prescribed in section three of this act.

Sec. 5. When two or more reputable citizens of any county in this State shall notify said veterinarian that any animals in their county are affected with a contagious disease the tendency of which is to cause the death of such animals, he shall investigate the same, or cause an investigation thereof to be made; and for such purpose he or his assistant shall have the right to go upon any premises on which such affected animals are or where they are supposed to be. Said veterinarian shall have the right to treat such affected animals at the expense of the owner or owners of the same, or shall have the right to cause the same [to be] destroyed, under such rules and regulations as may be prescribed by the said board. No compensation shall be paid to the owner or owners of any animals destroyed under the provisions of this section. The necessary expenses incurred by the veterinarian or his assistant in the discharge of the duties prescribed in this act shall be paid from the funds of Clemson College.

Sec. 6. This act shall take effect from its passage; and all acts and parts of acts inconsistent herewith are hereby repealed.

Approved February 19, 1901.

SOUTH DAKOTA.

AN ACT Providing penalties for the unlawful transportation of diseased swine.

Be it enacted by the Legislature of the State of South Dakota:

Duty of officers. Section 1. It shall be the duty of every sheriff, deputy sheriff, constable, or other peace officer, whenever he learns or is informed that any person is unlawfully engaged in the transportation of diseased swine, or swine that have died from any disease, to forthwith examine into the matter, and upon being satisfied of the truth thereof to immediately seize the outfit so engaged and arrest the person or persons in charge thereof and bring them before some magistrate for further proceedings in conformity with the provisions of chapter 131 of the session laws of 1899.

Disposition of diseased swine. Sec. 2. In all cases where a conviction is had upon such arrest and the court finds that the swine so seized are affected with or have died from any swine disease, the court shall order the officer making such seizure to forthwith burn or bury such swine, as provided by law, and also to burn the wagon or other vehicle in which said swine were found: *Provided*, That if such wagon or other vehicle can be thoroughly disinfected at a less cost than the value of such wagon or other vehicle, then the court shall order the officer to thoroughly disinfect such wagon or other vehicle and the reasonable cost and expense of such disinfection shall be a lien upon such wagon or other vehicle and the officer may retain possession of the same until such cost and expense is paid: *Provided further*, That if the same be not paid within ten days then such officer shall sell such wagon or other vehicle to satisfy such cost and expense as for a pledge.

Officer's fees. Sec. 3. The officer making such seizure and performing such services, shall, in addition to the fees now allowed by law, be entitled to and receive one-half of the fine imposed, and in case such fine is not collected shall receive in lieu thereof and in addition to his other fees the sum of ten dollars ($10).

Sec. 4. All acts and parts of acts in conflict with the provisions of this act are hereby repealed.

Approved March 4, 1901.

AN ACT To amend section 2333 of the compiled laws.

Be it enacted by the Legislature of the State of South Dakota:

State veterinarian. Section 1. That section 2333 of the compiled laws be and the same is hereby amended to read as follows:

"Sec. 2333. The veterinary surgeon shall receive for his services the sum of twelve hundred dollars ($1,200) per annum, together with his necessary traveling expenses actually paid out when in performance of his duty. These payments shall be made from any funds in the State treasury not otherwise appropriated, upon itemized vouchers signed and sworn to by him and submitted to the State auditor, who shall draw warrants upon the State treasurer for the amounts found correct, separate vouchers being made for salary and expenses. No person shall be competent under this act to receive the appointment of veterinary surgeon who is not at the date of his appointment a graduate in good standing of a recognized college of veterinary surgeons and of not less than five years' actual practice. He shall hold his office for two years. He may be removed for cause by the governor, who shall also have power to fill the vacancy as hereinbefore provided. The appraisers herein provided for shall each receive three dollars ($3) for each day or part of a day they may be actually employed as such, which shall be paid from the State treasury out of the stock-indemnity fund hereinafter provided, upon vouchers which bear the certificate of the justice who summoned them. The justice of the peace shall receive for his services the fees provided by law for similar services, to be paid out of the county general fund. The veterinarians, physicians, or freeholders called in consultation by the veterinary surgeon shall each receive three dollars ($3) for each day or part of a day they may be actually so employed and five (5) cents per mile mileage for distance necessarily traveled, which sums shall be paid from the State treasury out of the stock-indemnity fund hereinafter provided for, upon vouchers certified to by the veterinary surgeon, and other incidental expenses connected with his work and made his duty by this act, such as causing animals to be slaughtered and their carcasses to be burned or buried, and disinfecting infected premises, shall be paid from the State treasury out of the stock-indemnity fund hereinafter provided for, upon vouchers certified to by him under oath. Before entering upon the discharge of his duties he shall give a bond to the State of South Dakota, with good and sufficient surety, in the sum of ten thousand dollars ($10,000), conditioned for the proper discharge of the same. No constructive mileage shall be paid under this act, nor shall the veterinary surgeon receive any mileage."

SEC. 2. All acts and parts of acts in conflict with this act are hereby repealed.

SEC. 3. An emergency is hereby declared to exist, and this act shall take effect and be in force from and after its passage and approval.

Approved, February 28, 1901.

TENNESSEE.

AN ACT To create the office of State live-stock inspector, to provide for the appointment of the inspector, fix his salary, define his duties, and provide for the appointment of his deputies.

Be it enacted by the General Assembly of the State of Tennessee:

Appointment of inspector. SECTION 1. That the commissioner of agriculture or secretary of the board or department of agriculture shall appoint, at a salary of $1,500 per annum and his traveling expenses while in discharge of his duties, some competent person, to be known as State live-stock inspector, whose term of office shall be two years from the date of his appointment, or until his successor is elected and qualified: *Provided*, That said commissioner, or the secretary in conjunction with the members of the said board or department of agriculture, shall have power to remove from office said inspector.

Duties of inspector. SEC. 2. *Be it further enacted*, That said live-stock inspector shall devote his time exclusively to the protection of the live-stock interests of the State, and shall be charged especially with the formulation and enforcement of all rules and regulations for quarantining against or otherwise preventing and for eradicating communicable diseases among domestic animals in the State, as provided for in all the public acts upon this subject.

Deputy inspectors. SEC. 3. *Be it further enacted*, That said live-stock inspector shall be empowered to appoint, for definite periods of time by him designated, and at salaries fixed by him, not to exceed $75 per month each and their actual expenses, itemized and sworn to, three deputy inspectors, one for each grand division of the State: *Provided*, That the salaries of himself and his deputy inspectors and all expenditures made by him shall not exceed the amount specifically appropriated for this purpose: *And provided further*, That neither said State live-stock inspector nor any of his deputies shall have any power to expend any other funds of the State, nor to charge the State with any further liability: *Provided further*, That the appointment of the deputy inspectors shall be approved by the bureau or board of agriculture before they enter upon the discharge of their duties.

Inspector to make quarterly report. SEC. 4. *Be it further enacted*, That said State live-stock inspector shall make to the commissioner of the bureau of agriculture a quarterly report of all moneys received and all disbursements made by him during the preceding quarter, accompanied by the proper vouchers.

SEC. 5. *Be it further enacted*, That any and all laws or parts of laws in conflict with this act be, and the same are hereby, repealed.

SEC. 6. *Be it further enacted*, That this act shall take effect from and after its passage, the public welfare requiring it.

Approved, April 16, 1901.

AN ACT To prevent the spread of communicable diseases among domestic animals in the State of Tennessee, and to provide greater protection to the live-stock industry of the State, and to provide penalties for the violation of this act, and to repeal chapter 424 of the acts of 1899, and to amend chapter 46 of the acts of 1897.

Be it enacted by the General Assembly of the State of Tennessee:

Owners must report disease. SECTION 1. That it shall be the duty of the owner or person in charge of any domestic animal or animals who discovers, suspects, or has reason to believe that such animal or animals as aforesaid are afflicted with any communicable disease, to immediately report the fact, belief, or suspicion to the county board of health of the county in which said domestic animal or animals are found.

State officials to cooperate. SEC. 2. *Be it further enacted*, That it shall be the duty of the commissioner of agriculture and State live-stock inspector to cooperate with the officials of the Federal Government, and with those of other States, in establishing interstate quarantine lines, and in enforcing such rules and regulations as shall best protect all live-stock industry of the State against splenetic, or Texas, fever.

Investigation of outbreaks. SEC. 3. *Be it further enacted*, That the county board of health of each county, whenever any case or cases of communicable disease among the domestic animals of their county is reported to exist, shall immediately cause the same to be investigated, preferably by a qualified veterinarian, and should such investigation show a reasonable probability that such animal or animals are affected with a communicable disease the said county board of health shall immediately establish such temporary quarantine as may be necessary, in their judgment, to prevent the spread of disease, and shall without delay report all action taken to the State live-stock inspector, and the acts of the said county board of health establishing said temporary quarantine shall have the same force and effect as though established by the commissioner of agriculture and the State live-stock inspector, until such time as they shall take charge of the case or cases, and the county board of health of every county in the State shall adopt and enforce such rules and regulations as said commissioner of agriculture and the State live-stock inspector may prescribe, having for their object the prevention and restriction of splenetic, or Texas, fever, or any other communicable disease, among domestic animals which may be either threatened or developed in such localities. And all expenses incurred by the county boards of health in carrying out the provisions of this act shall be a county charge, and shall be paid in like manner as other expenses of the county now are.

Violation of quarantine law. SEC. 4. *Be it further enacted*, That any person, firm, or corporation who shall knowingly import or introduce any cattle or other domestic animal into the State of Tennessee from any district south of the quarantine line, as established, or as may be established by the Secretary of the United States Department of Agriculture, or Congress, which is affected with splenetic, or Texas, fever, or which bears upon its or their body or bodies fever ticks (*Boophilus boris*), or other causes of said diseases, unless such cattle so introduced or imported are immediately slaughtered, or are brought into the State in conformity with such rules and regulations as may be prescribed by the commissioner of agriculture and State live-stock inspector, shall be guilty of a misdemeanor, and, upon conviction thereof, shall be fined in any amount not less than five hundred dollars ($500) nor more than five thousand dollars ($5,000), or confined in the county jail for not less than one nor more than three years, in the discretion of the court.

Owners must submit to investigation. SEC. 5. *Be it further enacted*, That any person who owns or is in possession of live stock reported or suspected to be affected with any communicable disease, or with insects which may produce such disease, who shall refuse to allow said county board of health, or anyone acting under its orders, or the State live-stock inspector, or anyone acting under his orders, to examine such stock, or who shall hinder or obstruct any of them in any examination of or in any attempt to examine such stock, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than fifty dollars ($50) nor more than two hundred dollars ($200).

Owners must confine diseased animals. SEC. 6. *Be it further enacted*, That any person who shall have in his or her possession any domestic animal affected with any communicable disease or fever tick, knowing such animal to be affected, who shall permit such animal or animals to run at large, or who shall keep such animal or animals where other domestic animals not affected by or previously exposed to such communicable disease, may be exposed to its contagion or infection, or who shall ship, drive, sell, traffic, or give away such animal or animals which have been exposed to such infection or contagion, or who shall move or drive any domestic animal in violation of any direction, rule, regulation, or order of said commissioner of agriculture or live-stock inspector establishing and regulating live-stock quarantine, or the restriction or spread of communicable diseases among domestic animals, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any amount not less than fifty dollars ($50) nor more than one hundred dollars ($100) for each of such exposed or diseased domestic animals which he or she shall permit to run at large, or sell, ship, drive, trade, or give away in violation of the provisions of this act: *Provided*, That any owner of domestic animals which have been affected with or exposed to any communicable disease may dispose of the same after having obtained from said commissioner of agriculture, or the live-stock inspector, or the State veterinary surgeon, a certificate of health for such animal or animals.

General supervision. SEC. 7. *Be it further enacted*, That the commissioner of agriculture and the State live-stock inspector shall have the general supervision of all communicable diseases among domestic animals within, or that may be in transit through the State, and they are empowered to establish quarantine against any animal or animals thus diseased, whether within or without the State, and may make such rules and regulations against the spread and for the suppression of said disease or diseases as in their judgment may seem necessary and proper; and in the enforcement of such rules and regulations they shall have the power to call on any one or more of the peace officers, whose duty it shall be to give all the assistance in their power.

Quarantine must not be evaded. SEC. 8. *Be it further enacted*, That any person who wilfully hinders, obstructs, or otherwise disregards or evades such quarantine as they may declare, or violate any rule or regulation they shall make in attempting to stamp out or restrict the spread of any disease or diseases aforementioned, or who shall resist any peace officer acting under them, or either of them, shall be guilty of a misdemeanor, and upon conviction shall be fined not less than fifty dollars ($50) nor more than five hundred dollars ($500), or imprisoned in the county jail for a period of three months, or both, at the discretion of the court.

Owners to report outbreaks. SEC. 9. *Be it further enacted*, That in the event of any communicable disease aforesaid breaking out or being reasonably suspected to exist in any locality in this State it shall be the duty of the local health authorities, or persons owning or having any interest whatever in said animals, immediately to notify the said live-stock inspector of the fact, when he shall institute such measures for the restriction or stamping out of such disease or diseases as he may think necessary. Any person or persons specified who shall neglect or refuse to notify said live-stock inspector of the existence of any communicable disease, as aforementioned, shall be guilty of a misdemeanor, and upon conviction shall be fined not more than ten dollars ($10), or confined in the county jail not exceeding two months, or both, at the discretion of the court.

Valuation of condemned animals. SEC. 10. *Be it further enacted*, That whenever, in the opinion of the State live-stock inspector, the public safety demands the destruction of any animal or animals under the provisions of this act, he shall, before ordering the killing or slaughtering of the same, appoint three competent and disinterested freeholders, who shall be affirmed or sworn before proceeding to act, and they shall make a just and true valuation of said animal or animals to be so killed or slaughtered, and in valuing shall consider the health and condition of the animal when killed, and they shall make and deliver a written certificate, setting forth all the essential facts in the case to the lawful owner, who shall present the same for payment to the chairman of the county court of the county in which such animal or animals are so killed or slaughtered, and the same shall constitute a county charge, to be paid as other claims against the county are.

Trading in diseased stock. Sec. 11. *Be it further enacted,* That any person or persons who knowingly shall import or bring into this State any animal or animals affected with pleuropneumonia, rinderpest, glanders, or any other communicable disease, or who shall sell or trade, or offer for sale or trade, any animal or animals so diseased, shall be guilty of a misdemeanor, and upon conviction shall be punished by a fine of not more than one hundred dollars ($100), or imprisoned in the county jail for a period not exceeding three months, or both, in the discretion of the court.

Federal action. Sec. 12. *Be it further enacted,* That the governor of the State, with the commissioner of agriculture and the State live-stock inspector, may cooperate with the Government of the United States for carrying out the purposes of this act, and the governor is hereby authorized to receive and receipt for any moneys receivable by this State under the provisions of any act of Congress which may at any time be in force upon this subject, and to pay the same into the State treasury, to be used according to the act of Congress and the provisions of this act as nearly as practicable.

County inspector. Sec. 13. *Be it further enacted,* That there may be appointed by the county board of health of each county in the State a competent person, to be known as county live-stock inspector, and whose appointment shall be ratified or rejected at the first term of the quarterly court following appointment, whose duty it shall be to look after the detection and suppression of communicable diseases among domestic animals in his county, and whose compensation shall be fixed by the county court of his county and paid out of the county treasury.

Veterinary surgeon. Sec. 14. *Be it further enacted,* That the commissioner of agriculture and the State live-stock inspector may, when they see proper, employ a competent veterinary surgeon, who shall work under their direction and supervision, and whose compensation shall not exceed the appropriation made for him by law, and who may at any time be discharged by said commissioner and inspector.

Act of 1899 repealed. Sec. 15. *Be it further enacted,* That chapter 424 of the acts of 1899, entitled "An act to amend an act passed March 24, 1897, and approved March 26, 1897, entitled 'An act to reorganize the State board of health of the State of Tennessee,'" be and is hereby repealed.

Act of 1897 repealed. Sec. 16. *Be it further enacted,* That chapter 46 of the acts of 1897, entitled "An act to reorganize the State board of health of the State of Tennessee," be and is hereby amended as follows:

First. By striking out of section 1 the words "one representative live-stock breeder actually engaged in the breeding of live stock."

Second. By striking out of section 2 the words "and one representative live-stock breeder."

Third. By striking out of section 4 the words "the term of office of the representative of the live-stock breeders of the State shall be for six years from date of appointment."

Fourth. By abolishing the office of the live-stock breeder on the State board of health.

Sec. 17. *Be it further enacted,* That this act take effect from and after its passage, the public welfare requiring it.

Approved April 20, 1901.

VERMONT.

AN ACT In amendment of section 4815, chapter 203, of Vermont statutes, relating to the appraisal of animals slaughtered by order of the board of agriculture.

It is hereby enacted by the General Assembly of the State of Vermont:

SECTION 1. Section 4815, chapter 203, of the Vermont statutes is hereby amended to read as follows:

"SEC. 4815. The value of all cattle or other domestic animals, killed by the written order of the board of agriculture, shall be appraised by one of said board and a disinterested person selected by the owner of the condemned animals, but if these two can not agree upon the amount of the appraised value of the animal, they shall select a third disinterested person, who, together with them, shall appraise the animal; such appraisal to be made just before killing, and on a basis of health. The limit of the appraisal of cattle shall be forty dollars ($40.) A postmortem examination shall be made, and, if the animal be found affected with bovine tuberculosis or any disease dangerous to the public health, the owner of the animal shall receive one-half the appraised value; but if no bovine tuberculosis or disease dangerous to the public health be found, the owner of the animal shall receive the full amount of the appraisal, and in addition shall receive the slaughtered animal. The amount which the owner is entitled to receive shall be paid by the State to the owner of such animal or animals upon a written order, signed by the member of the board in charge and countersigned by the secretary of said board. No indemnity shall be paid to the owner of condemned cattle or other domestic animals that have not been owned and kept in the State for at least six months previous to the discovery of the disease, unless such animals have been, at time of importation, duly examined under the regulations of the board and pronounced free from disease."

Penalty. Any person who shall knowingly violate or refuse to comply with any regulations made by such board of agriculture, under the authority and provisions of this section, shall be fined not more than two hundred dollars ($200) or imprisoned not more than two years, or both.

Approved, November 22, 1900

WASHINGTON.

AN ACT To create the office of sheep inspector and prescribe the duties thereof; to prevent the spread of contagious and infectious diseases among sheep; to provide for the collection of damages for the spreading of disease among sheep; and to repeal an act entitled "An act in relation to and to prevent the introduction or spread of disease among sheep, approved February 2, 1888;" and to repeal an act entitled "An act in relation to and [to] prevent the introduction or spread of disease among sheep," approved February 26, 1897, and declaring an emergency.

Be it enacted by the Legislature of the State of Washington:

Appointment of sheep inspector. SECTION 1. The county commissioners of each county in this State may, immediately upon this act going into effect, appoint a qualified person as sheep inspector, for and within the boundaries of their counties, who shall hold office until noon on the second Monday in January, 1903, and until his successor is appointed and has qualified as herein provided; any vacancies by resignation, or otherwise, in said office shall be immediately filled by said county commissioners: *Provided, however,* That the county commissioners of any county may at any time remove said sheep inspector from office and declare the said office vacant, without a hearing or without assigning any cause therefor, for such reasons alone as may cause them to deem it expedient to act in the premises.

Election of successor. SEC. 2. At the regular meeting of the board of county commissioners next prior to the second Monday in January, 1903, said county commissioners may elect a sheep inspector, whose term of office shall begin at noon on the second Monday in January, 1903, and continue for a period of two years, unless sooner removed as hereinbefore provided, and until his successor is elected and has qualified, and said county commissioners shall elect a sheep inspector each two years thereafter at such meeting, who shall from time to time hold office upon the conditions above and herein provided.

Oath and bond. SEC. 3. The sheep inspector before entering upon the discharge of the duties of his office shall take an oath of office, and enter into a bond, with two or more sureties, to be approved by the county commissioners, in the penal sum of two thousand dollars ($2,000), conditioned for the faithful performance of his duties as such sheep inspector.

Inspector may appoint two deputies. SEC. 4. Such inspector shall have the power to appoint not more than two deputies, for whose acts he shall in all cases be responsible, and by whom he may perform any act or duty required of him by law. Each inspector shall be provided with a seal of office, which shall be inscribed in substance as follows: "Sheep inspector of ——— County, Washington," and each official certificate, notice, or report of such inspector shall be authenticated by such seal.

Quarantine regulations. SEC. 5. Whenever it is shown to the sheep inspector of any county that scab, or scabies, or any contagious or infectious disease is epidemic in certain localities in any county of this State or other State, Territory, province, or country, the said inspector must thereupon designate such locality or localities and prohibit the importation from such locality or localities of any sheep into his county, except under such restrictions as are provided for in this act. This action upon the part of the said inspector shall be known as and shall be deemed to be a quarantine against such locality or localities, and the sheep inspector shall file a notice of such quarantine attested under the seal of his office with the county auditor of his county, who shall provide and keep a book, which shall be properly indexed and open to the public during the office hours of said office, in which said notice shall be transcribed, said book to be designated as the "Sheep Quarantine Register" of said county, and a copy of said notice shall be posted at the front door of the court-house of said county by the said inspector at the time the same is filed with the said auditor, and this shall be deemed to be full notice to all parties concerned of the existence of the sheep quarantine, and it shall be the duty of the inspector to raise the said quarantine when he discovers that the cause for its existence has ceased, and it shall be his duty from time to time to ascertain the condition in the quarantined locality or localities so as to raise said quarantine when he discovers that the cause for its existence has ceased; and upon said quarantine being raised, said inspector shall give notice of its rescission with the county auditor of his county, and post a copy of said notice at the front door of the court-house of said county, and said auditor shall transcribe said notice of rescission in the same book and in the same manner as he has transcribed the notice of the quarantine.

Importers to notify inspector. SEC. 6. Upon notice that a quarantine has been placed on record as hereinbefore provided for against any locality or localities, the owner or person in charge of any sheep which are intended to be brought into the said county from localities quarantined against, as provided in the next preceding section, must forthwith notify the sheep inspector of said county of such intention, and such owner or person in charge shall not allow any sheep from said locality so quarantined against to be brought into the said county doing the quarantining until such sheep have been quarantined and inspected by the sheep inspector as provided in the next succeeding section: *Provided*, That this section shall not apply to sheep being transported upon any railroad or steamer lines through the State of Washington to points beyond the limits of said State, and which are not allowed to graze upon the public range of said State while being so transported.

Inspection before entry into State. SEC. 7. Upon receiving notice of the intention of the owner or person in charge of any sheep, as provided in the last preceding section, to bring such sheep into any county of this State from any quarantined district, the sheep inspector of such county shall forthwith proceed to examine and inspect such sheep before they are brought into the State, and shall cause such sheep to be kept within certain limits designated by him for a period of sixty days, and shall cause the owner or person in charge of such sheep to dip them or otherwise treat them for the disease prevalent in the quarantined district; if at the expiration of said sixty days the said sheep inspector shall find the said sheep are free from scab, or scabies, and all contagious and infectious diseases, he shall issue a certificate to the owner or person in charge of such sheep permitting them to be brought into this State. When the county doing the quarantining is not one of the border counties of this State, and sheep from the quarantined localities have been permitted to be brought into the State by the inspector of the county or counties between said quarantining county and the border of the locality quarantined against, no certificate of the intermediary counties shall be final or binding upon the inspector of the county doing the quarantining, and such certificate shall not permit the owner or person having control of such sheep to bring them into the county quarantining upon such certificate, but in such a case the owner or person in charge of such sheep shall notify the sheep inspector of the county doing the quarantining of his intention to bring said sheep into said county and hold said sheep on the boundary of said county until the sheep inspector of said county shall reach such sheep, which he shall do as speedily as possible; the said sheep inspector shall then cause such sheep to be kept within certain limits designated by him for a period of sixty days, and shall cause the owner or person in charge of such sheep to dip such sheep or otherwise treat them for the disease prevalent in the quarantined district; if at the expiration of said time the said sheep inspector shall find that such sheep are free from scab, or scabies, and all contagious and infectious diseases, he shall issue a certificate to the owner or person in charge of such sheep permitting them to be brought into his county: *Provided, however*, That if said sheep have been quarantined as provided by this act in any other county in this State after coming into this State, said sheep not having been taken out of the State in the meantime, then the sheep inspector of the county into which the said sheep are to be brought, after satisfying himself that said sheep have been duly and properly quarantined as provided for in this act in such other county or counties, and are in a healthy condition, shall endorse this fact upon the certificate already possessed by the owner or person in charge of said sheep, which shall be deemed to be a certificate from the quarantining county, and shall be sufficient to permit said sheep to be brought lawfully into said county, and to travel therein until revoked or until such sheep become diseased.

Treatment of sheep on entering State. SEC. 8. Any person who is about to bring sheep into this State from any other State, Territory, province, or country must, before he brings said sheep into this State, notify the sheep inspector of the county in which he intends to first bring said sheep of the fact that he is about to bring said sheep into said county, the section from whence he intends to bring said sheep, and the time, as near as he can tell, when said sheep will arrive in said county. It shall then become the duty of said sheep inspector to be on hand at the time of the arrival of said sheep and inspect the same and cause the same to be confined within certain limits to be designated by him, the said sheep inspector. The said inspector shall also cause the said sheep to be dipped within ten days after the arrival of the said sheep in said county. The said sheep shall be kept within the boundaries prescribed or which may be prescribed from time to time by the said sheep inspector for the period of thirty days after they are dipped, when the inspector shall again inspect the sheep, when he may, in his discretion, if he finds said sheep are diseased or has any reasonable doubts as to the said sheep being in good condition, cause the same to be dipped and treated; and if he deems the same necessary to prevent the scattering of any contagious or infectious disease, he shall require the said sheep to be confined within certain limits for an additional period of thirty days.

Unlawful to move diseased sheep. SEC. 9. No person shall move or cause to be moved any sheep from any county to another in this State unless said sheep are sound and healthy and free from scab, or scabies, and all infectious and contagious diseases, which condition shall be solely evidenced by a certificate of the inspector, or his deputy, of the county from which said sheep are to be moved, obtained within ninety days immediately preceding such removal.

Inspection by request; certificates. SEC. 10. It shall be the duty of any sheep inspector, upon the request of any person, to visit and inspect any band of sheep within his county (or within five miles of the line of the State in another State or Territory); and if at the time of such inspection such sheep are healthy and free from scab, or scabies, and all infectious and contagious diseases, said inspector shall cause [issue to] the owner or person in charge of such sheep a certificate to that effect; and if he finds said sheep not healthy and infected with scab, or scabies, or other contagious or infectious diseases, he shall revoke any certificate which may have been issued by him showing such sheep to be in good condition, and such certificate so revoked shall thereafter be null and void and shall be no protection whatever thereafter to the person holding the same, and such person, on demand, shall deliver the same to such inspector forthwith.

Unlawful to import diseased sheep. SEC. 11. It shall be unlawful hereafter for any person, company, or corporation to bring into this State any sheep infected with the scab, or scabies, or any other infectious or contagious disease, and it shall also be unlawful for any person to bring into this State any sheep which have not been free from all evidence of scab, or scabies, or any contagious or infectious disease for at least three months prior to the time said sheep are brought into the State.

Isolation of diseased sheep. SEC. 12. Any person owning or having charge of any sheep infected with scab, or scabies, or any infectious or contagious disease shall keep the same and all sheep with which such sheep have been in contact, and the band or herd in which said sheep have been kept, secure from contact with other sheep and shall not drive or permit the same to go upon any public road or highway or any inclosed or uninclosed land not owned or leased by such person: *Provided*, That such sheep may be moved or driven upon public roads or highways by first obtaining the written permission of the sheep inspector of the county wherein such sheep may be, which permission shall state the time within which such sheep are to be moved, the place to and from which they are to be moved, and the route to be traveled: *Provided*, That nothing contained herein shall be construed as giving any inspector any authority to grant any person any right to herd said sheep or the band or herd with which such sheep have been kept upon any public road or highway or any traveled trail or road.

Duties of inspectors. SEC. 13. It shall be the duty of each sheep inspector to visit and inspect every band of sheep within his county during the months of April or May each year; and at such other times when he is informed in writing, or has reason to believe, that any sheep within his county are infected with scab, or scabies, or any infectious or contagious disease, he shall immediately visit such sheep and inspect the same, and upon request of sheep owners representing at least fifty thousand head of sheep he shall also inspect all the sheep in his county also between the 25th day of August and the 25th day of September of any year when so requested.

Regulations for diseased sheep. SEC. 14. Whenever upon inspection of any band or herd of sheep, or of any sheep, in any county of the State of Washington the sheep inspector of such county shall find any of said sheep affected with scab, or scabies, or other infectious or contagious disease, he shall forthwith notify the owner or person in charge of such sheep, in writing, to put such diseased sheep and the herd, or band, in which they have been kept into an enclosure, or, if such sheep are on the range, to put and keep such diseased sheep and the herd or band in which they have been kept within certain limits, which shall be designated and defined in such notice by reference to natural or artificial objects, and which shall be known and designated in this act as the "sheep quarantine limits," and the inspector shall require the owner or person in charge of such sheep to proceed immediately to treat such sheep and the band, or herd, in which they have been kept for the cure of such disease, by some means approved by the inspector, provided that when a dip is used the dip hereinafter provided for shall be used; and any person who shall neglect for three days after the service of such notice to put such sheep into an enclosure, or within the limits designated by such inspector, or shall refuse or neglect to proceed to treat such sheep for the cure of such disease by a remedy approved by the inspector and herein provided within three days after the time fixed by the inspector, which must be reasonable and give ample time to said party to prepare to dip and treat said sheep, shall be deemed guilty of a misdemeanor; and for each day of such neglect or refusal to comply with the order of said inspector after three days from the date of said notice such person shall be deemed guilty of a separate misdemeanor, and, in addition to the punishment provided for in this act, the inspector shall take charge of such sheep and place them within a proper enclosure or within proper limits and keep them there, and cause them to be treated as directed, and the expense of such siezure, keeping, and treatment, together with the fees of the inspector, shall be a charge on the sheep so seized, and shall be a lien thereon prior to any other lien upon said sheep.

Owners must assist inspectors. SEC. 15. The sheep inspector shall have the authority to corral any sheep which he may desire to examine and the person having charge of such sheep shall, when so requested, assist the said inspector in catching and examining said sheep, and any person being the owner, or in charge thereof, or assisting to care for, any sheep who shall refuse to assist said inspector, when requested as hereinbefore provided, and any person who shall secrete any diseased sheep to prevent the inspector from examining the same, or who shall prevent the inspector from examining any sheep, or in any way interfere with such inspector discharging the duties of his office, shall be deemed guilty of a misdemeanor. Any person who shall drive any sheep or cause any sheep to be driven upon or within the limits set apart for any quarantined sheep by a sheep inspector while the same are being occupied by such quarantined sheep, and any person who shall drive any sheep, or cause any sheep within such quarantine limits to be driven, out of the said quarantine limits shall be deemed guilty of a misdemeanor: *Provided, however*, That the sheep inspector shall not quarantine any sheep within three miles of any shearing corral, except corrals owned by the owners of said sheep or leased by him [them].

Inspector may change quarantine limits. SEC. 16. The sheep inspector shall have the authority, upon written application of the owner or person in charge of any quarantined sheep, to change the quarantine limits of such sheep for the purpose of procuring sufficient feed for such sheep, and to reestablish new quarantine limits, and this may be done from time to time in the discretion of the inspector.

Certificate necessary for travel. SEC. 17. No owner of any toll bridge or ferry boat, or person in charge thereof, shall permit any sheep to cross any bridge or go upon any ferry boat in charge of such person or persons, unless the person in charge of such sheep shall first exhibit to the person in charge of such bridge or boat a valid certificate issued by an inspector appointed under this act, to the effect that such sheep are free from scab, or scabies, or any contagious or infectious disease.

Certificates void after one year. SEC. 18. Every certificate issued under this act to the owner of sheep continuously kept within this State shall be null and void after one year from the date thereof, and every certificate issued to the owner of any band, or herd, of sheep which are not continuously kept within this State during the year which such certificate was issued shall expire upon such sheep being driven out of this State at any time after said certificate has been issued.

Salary of inspectors. SEC. 19. Every sheep inspector and deputy inspector shall be paid five dollars ($5) per day for each day when necessarily engaged in the duties of his office and five (5) cents per mile for each mile necessarily traveled by him for such purpose, and his bills for such purposes shall be audited and paid by the county commissioners of the county from which he was appointed.

Unlawful to drive without certificate. SEC. 20. No person shall drive any sheep or cause any sheep to be driven upon the public roads, upon the public ranges, or traveled trails or roads within this State except as herein provided, unless he has a valid certificate showing that said sheep are free from scab, or scabies, or infectious or contagious disease.

Liability for damages. SEC. 21. Nothing in this act shall be construed as exempting any person owning sheep from liability in a civil action for damages for negligently or carelessly spreading scab, or scabies, or any other contagious or infectious diseases, but any person so spreading or causing said disease to be spread, either personally or through his agents in charge of sheep belonging to him, shall be liable in a civil action for damages sustained by any other person for injury to such other person's sheep by the infecting of such sheep with the scab, or scabies, or any other contagious or infectious disease, the same as if this act had not been passed, and no certificate issued under the provisions of this act shall be any defense or excuse in an action for damages of this character. Any damages that may be recovered in such a civil action for damages shall be a lien upon the sheep infected as stated herein by any other band or herd of sheep, for which infection such suit may have been brought, and the court in rendering judgment in any action brought for such damages shall declare such judgment to be a lien upon such sheep and direct them to be sold under special execution to pay such judgment.

Legal action and attorneys' fees. SEC. 22. The liens herein provided for shall be foreclosed by an action brought in the superior court for the county wherein the lien originated in the name of the said county by the prosecuting attorney for said county as chattel mortgages are foreclosed, by a suit in the superior court, and upon commencing such an action in said court the prosecuting attorney shall immediately move for the appointment of a receiver to take charge of said sheep and keep the same pending the action, and it shall be the duty of the court to appoint such receiver without notice, and all the expenses thereof and all the costs that are taxed in civil actions between individuals shall be taxed up in favor of the county in such a proceeding, and an attorney's fee of fifty dollars ($50) shall be taxed in such a proceeding in addition to the attorney's fee allowed by law in a civil action, and all the said costs and attorney's fees shall be paid into the county treasury and shall be credited to the same fund to which the fees collected by county officers are credited: *Provided*, That the sheep inspector may employ an attorney to assist the prosecuting attorney in such case, when said attorney's fees shall go to such attorney so employed.

Fraud by inspector. SEC. 23. The sheep inspector and his deputies shall in case that they or either of them, or any of them, shall act fraudulently in administering this law, or enter into collusion with any person to evade it or to avoid the consequences of its violation, shall be deemed guilty of a misdemeanor, and punished as hereinafter provided.

Return of sheep illegally moved. SEC. 24. Sheep brought into any county in this State or moved through the said county without a proper certificate shall be returned under the direction of the sheep inspector to the place from which they were so illegally moved, should the same be in the county where they are found, and if such place should be without the county, they shall be moved to the border of the county where they are so found, and they shall there be held by the sheep inspector until the charges for driving said sheep or conveying said sheep to said point have been paid, including five dollars ($5) per day for the inspector or his deputy while engaged in such work, and such expenses shall be a lien against said sheep, and shall be enforced as other liens herein provided are enforced: *Provided*, That said sheep shall only remain in the hands of the inspector until the appointment of a receiver by the court to take charge of the same, and it shall be the inspector's duty to see that this is done speedily.

Location of quarantine lines. SEC. 25. In establishing the quarantine limits herein provided for the same shall be established only upon the range or land leased or owned by the owner of the sheep or the person in charge thereof, except where the same can be established on public lands of the United States, not the customary range of another, or lands obtained from private parties by their consent, either by the sheep inspector or the owner of said sheep, or the person in charge thereof; and in case it shall become necessary for said sheep to be driven or transported to a place where the same may be quarantined without infringing the rights of others, the sheep inspector shall carefully provide the route to be taken by said sheep and supervise the movement thereof, and see to it that said sheep shall not come into contact with other sheep or near enough to affect them with the scab, or scabies, or any other contagious or infectious disease.

Disease must be reported. SEC. 26. It is hereby made the duty of every sheep owner and of every person having charge of sheep, or herding or working with sheep in any capacity, to report to the sheep inspector of the county where such sheep are located the existence of scab, or scabies, or any other contagious or infectious disease among said sheep as soon as possible after such person has knowledge of the existence thereof, and any such person who fails to give such information to such sheep inspector, or who knowingly or wilfully conceals the existence of such disease or diseases amongst the sheep owned by him, or in his charge, or being herded by him or with which he is working in any capacity, shall be guilty of a misdemeanor, and punished as hereinafter provided.

Penalty.

Constitutionality. SEC. 27. In the event of any part of this act being declared invalid or unconstitutional by any court, the remainder of the act shall be and remain in full force and effect.

Words defined. SEC. 28. The word "person" as used in this act shall include corporations, firms, associations, and companies, as well as individuals, and the words "sheep inspector" or "inspectors" wherever used herein shall be deemed to be used as "sheep inspector" as established in this act, and the word "deputy" or "deputies" shall be deemed to follow the word "inspector" wherever used in this act.

General penalty. SEC. 29. Any person who shall violate this act, or any part thereof, shall be deemed to be guilty of a misdemeanor, and on conviction thereof shall be fined not less than two hundred and fifty dollars ($250) nor more than five hundred dollars ($500), or be punished by confinement in the county jail for not less than thirty days nor more than six months, and for the commission of the acts herein which are specifically declared in various parts of this act to be misdemeanors, aside from the general provisions contained in this section, the person guilty thereof shall be punishable by a fine of not less than fifty dollars ($50) nor more than five hundred dollars ($500), or by confinement in the county jail for not less than ten days nor more than six months.

Laws of 1888 and 1897 repealed. SEC. 30. The act of the legislative assembly of the Territory of Washington approved February 2, 1888, entitled "An act in relation to and to prevent the introduction or spread of disease among sheep," and the act of the legislature of the State of Washington approved February 26, 1887, and entitled "An act in relation to and to prevent the introduction or spread of disease among sheep, and repealing an act in relation to and to prevent the introduction or spread of disease among sheep, approved February 2, 1888, and declaring an emergency," are each hereby repealed, and all other acts and parts of acts in conflict with this act are hereby repealed.

Emergency. Sec. 31. An emergency exists, and this act shall take effect immediately.

Approved March 16, 1901.

AN ACT To amend sections 2 and 5 of an act entitled "An act providing for the creation of the office of the State veterinary surgeon and defining his duties," approved March 22, 1895.

Be it enacted by the Legislature of the State of Washington:

Duties of State veterinarian. Section 1. That section 2 of an act approved March 22, 1895, entitled "An act providing for the creation of the office of the State veterinary surgeon and defining his duties," be, and the same is hereby, amended to read as follows:

"Sec. 2. He shall have general supervision of all contagious and infectious diseases among domestic animals within or that may be in transit through the State, and he is authorized and empowered to inspect and test all cattle within the State for tuberculosis whenever in his judgment it is deemed advisable, and he is empowered to establish quarantine against any and all such animals affected with any contagious or infectious disease or diseases, or that have been exposed to others thus diseased, whether within or without the State; and he may, with the concurrence of the State board of health, make such rules and regulations as he may deem necessary for the protection against the spread and for the suppression of said disease or diseases, which rules and regulations, after the concurrence of the governor, shall be published and enforced, and in doing said things, or any of them, he shall have the power to call on any one or more peace officers, whose duty it shall be to give him all the assistance in their power."

Destruction of diseased animals. Sec. 3. That section 5 of said act be amended to read as follows:

"Sec. 5. Whenever in the opinion of the State veterinary surgeon the public welfare demands the destruction of any diseased animal under the provisions of this act, he shall cause the same to be destroyed. No stock shall be destroyed except on the written order of the State veterinary surgeon. The governor of the State, with the State veterinary surgeon, may cooperate with the Government of the United States for the object of this act, and the governor is hereby authorized to receive and receipt for any money receivable by this State through provisions of any act of Congress which may at any time be in force upon this subject, and to pay the same into the State treasury to be used according to the act of Congress and the provisions of this act."

Approved March 16, 1901.

WEST VIRGINIA.

AN ACT To prevent the introduction and spread of contagious diseases among domestic animals.

Be it enacted by the Legislature of West Virginia:

That chapter fifty-three of the acts of one thousand eight hundred and ninety-nine be amended and reenacted and additional section added thereto, so as to read as follows:

Quarantine regulations. 1. That when it shall be brought to the notice of the secretary of the board of agriculture that any contagious or infectious disease not otherwise provided for by law prevails among domestic animals, he shall take such measures to prevent its spread as may be deemed expedient, and for this purpose shall give written instructions or permits to one or more of his consulting veterinarians of the State board, giving him or them power to place infected animals, herds, buildings, lots, and farms in quarantine and to prevent the movement of animals or objects likely to carry the contagion, except on proper permits by one or more of the said consulting veterinarians.

Veterinarian to report. 2. All the work of the veterinarians shall be promptly and fully reported to the secretary on such blanks and forms as he may supply, and with the consent and approval of the board, and such rules and regulations for the government of such quarantine as may be deemed necessary to effectively carry out the provisions of this act may be adopted and enforced.

Penalty for violation. 3. That any person, persons, or corporation who shall fail to report to the said secretary any importation of any domestic animals for breeding purposes into this State, or who shall wilfully or intentionally interfere with any officer or officers authorized to carry out the provisions of this act, or who shall wilfully or intentionally violate the provisions of the quarantine authorized in this act, shall be deemed guilty of a misdemeanor, and upon conviction shall be liable to imprisonment of not exceeding three months, or a fine not exceeding one hundred dollars ($100), or both, at the discretion of the court.

Inspection of herds. 4. That it shall be the duty of the said consulting veterinarian, under the direction and control of the secretary, to visit once a year, at such time as the secretary may direct, and examine, and, if deemed necessary, test in a proper manner all thoroughbred herds of twenty or more within this State which are kept for the purpose of producing animals for breeding purposes and to be sold to the public as such. Should the veterinarian making the examination find such animals free from any contagious or infectious disease, he shall issue to the owner or owners a certificate stating that fact. Should he find any contagious or infectious disease prevailing, he shall then proceed as authorized in section seven of this act. It shall further be the duty of said consulting veterinarian, under the same direction and control, to visit annually, at such time as the secretary may direct, and inspect, and, if deemed necessary, thoroughly test all dairy herds of ten or more cows within this State, the products of which are sold to the public. Should the animals prove to be free from any contagious or infectious disease, said veterinarian shall issue to the owner or owners of such herd a certificate to that effect. Should any of the animals prove to be affected with tuberculosis or any other disease of a dangerous nature, it shall then be the duty of said veterinarian to proceed as authorized in section seven of this act.

Charges of veterinarian. For such services as are not prescribed for in this act said consulting veterinarian shall receive a per diem of four dollars ($4) per day for actual time of service, which shall be paid by the owner or owners of animals that are examined. The actual traveling and other expenses incurred by said veterinarian shall be paid by the State board of agriculture out of current appropriations for the purpose, on an order signed by the president and secretary of the said board. Full and complete reports of all services performed by the veterinarian shall be promptly made to the said secretary, on such blanks as he may supply and in such form as he may require.

Cases to be reported. 5. That it shall be the duty of the consulting veterinarians having cases in charge to report the same fully and promptly to the said secretary, in such form as he may prescribe.

Powers of veterinarian. 6. That when in the judgment of the secretary of the board public interest and safety demand it, he may give written authority to any consulting veterinarian of the board, who shall be a graduate of some reputable veterianary college, to examine any animal or animals or any buildings or farms suspected, and the decision of such veterinarian, after proper examination and under the provisions of this act and such rules and regulations as the board may prescribe, shall be final, and said veterinarian may proceed to quarantine, to destroy, to order burned or buried, or to take any other action authorized by this act and the rules of said board.

Compensation. For such services the veterinarian shall receive a per diem of four dollars ($4) per day and actual expenses while engaged, which shall be paid out of the current appropriations made for the enforcement of this act and on an order signed by the president and secretary of the board.

Appraisements. 7. That when it shall be found necessary or expedient to kill any animal or animals to prevent the spread of contagious or infectious diseases, it or they shall first be appraised by three disinterested and sworn appraisers, who shall have due consideration of the actual condition of the animal or animals at the appraisement, and the owner or owners of such animal or animals so destroyed shall be entitled to receive from the secretary of the board of agriculture a certificate of value, as appraised by said appraisers, subject to the consent and approval of said board. For such services each appraiser shall receive a per diem of one dollar ($1) per day, to be paid out of current appropriations made for the enforcement of this act and on an order signed by the president and secretary of the said board.

Payment for animals slaughtered. 8. That at the end of each fiscal year the holders of such certificates of value shall be paid the same from the current appropriations made for the purpose: *Provided*, That the amount to be paid on such certificates in any one year shall not exceed the sum of five thousand dollars ($5,000), which amount shall be paid pro rata at the end of each fiscal year, on an order signed by the president and secretary of the State board of agriculture.

Cooperation with United States Government. 9. That for the economical eradication of contagious or infectious diseases of domestic animals the secretary of the State board of agriculture shall have power, with the approval and consent of said board, to arrange for and carry into effect terms of cooperation with the proper officers of the National Government.

Repealing clause. 10. That all acts or parts of acts inconsistent herewith are hereby repealed.

Passed February 21, 1901. In effect ninety days from passage.
Approved February 22, 1901

WISCONSIN.

AN ACT For the establishment of a live-stock sanitary board.

The people of the State of Wisconsin represented in Senate and Assembly do enact as follows:

Constitution of board. SECTION 1. There is hereby constituted a State live-stock sanitary board, which shall consist of three members of the State board of agriculture, to be chosen by that body from its membership, the bacteriologist of the State agricultural college, and the State veterinarian; the last two mentioned members to be ex officio members of the board, and the State veterinarian to serve without additional compensation. The members selected from the State board of agriculture shall hold office for a term of three years, except that the member first chosen shall hold his position for one year, the second for two years, and the third for three years from the first day of June, 1901.

Compensation of members. They shall serve without salary, but shall be paid three dollars ($3) per day, and all members of the board shall be paid their actual expenses when in the discharge of their duties. Meetings of the board shall be limited to twelve in each year, and the service of no member on said board, for which a per diem is paid, shall exceed thirty days in any one year. The board may organize by the election of a president and secretary and shall hold its office in such room in the capitol as the governor may designate.

Duties of board. SEC. 2. It shall be the duty of the State live-stock sanitary board to protect the health of domestic animals of the State; to determine and employ the most efficient and practical means for the prevention, suppression, control, or eradication of dangerous, contagious, or infectious diseases among domestic animals; and for these purposes it is hereby authorized and empowered to establish, maintain, enforce, and regulate such quarantine and other measures relating to the movement and care of animals and their products, the disinfection of suspected localities and articles and the disposition of animals, as it may deem necessary, and to adopt from time to time all such regulations as may be necessary and proper for carrying out the purposes of this act: *Provided, however*, In the case of slowly contagious diseases, only suspected or diseased animals shall be quarantined, and in case of bovine tuberculosis or actimonycosis, the owner shall be granted the option of retaining the animals in quarantine, under such restrictions as the board may prescribe.

Slaughter and appraisement of animals. SEC. 3. Whenever the owner shall not exercise option and it shall be deemed necessary by the board to slaughter diseased animals, written notice shall be given to the owner, his agent, or the person in charge of such animals, and to a justice of the peace in the county in which the animals may be, of the purpose to order the slaughter thereof, giving the number and description of the animals and the name of the owner, if known. Such notice shall be entered on the docket of such justice, who shall immediately thereafter summon such owner, agent, or possessor, and also three disinterested citizens of the county, not residents of the immediate neighborhood in which such animals are owned or kept, to appraise the value thereof. Such appraisers shall, before entering upon the discharge of their duties, be sworn by such justice to make a true appraisement without prejudice or favor of the value of such animals, and they shall certify in their return that they have seen the appraised animals slaughtered. In making appraisement of diseased animals the appraisers shall determine their value in the condition in which they are found at the time of appraisement; but the appraised value of no single animal shall exceed fifty dollars ($50). If such appraised animals are slaughtered, said slaughter shall be made under the direction of the local health officer or the chairman of the town board. The owner of slaughtered animals shall receive no compensation for the same until the live-stock sanitary board is satisfied that the infected premises have been disinfected in such a manner as to prevent the further spread of disease.

Importations may be prohibited. SEC. 4. Whenever the State live-stock sanitary board shall have reason to believe that there is danger of the introduction into this State of any contagious or infectious disease prevailing among domestic animals in any district outside this State, or its dissemination from one district in this State to another, it shall investigate the existing conditions, and if it conclude that danger exists to the live-stock interests of this State therefrom, it may, with the advice and consent of the governor, prohibit the importation of animals of the kind diseased from the infected district into this State, or the moving of them from one part of the State to another, except under such regulations as the board may establish.

Owners must report disease. It shall be the duty of every person who shall have reason to suspect that there is upon his premises, or upon the premises occupied by him, or under his control, any domestic animal having a contagious or infectious disease, to immediately report the fact to the local board of health or some member of the same, who shall immediately report such case to the State veterinarian or the secretary of the board. The board or State veterinarian may require the owner of suspected stock to employ at his own expense a qualified veterinary surgeon to examine such stock and determine whether, in his opinion, the disease exists.

Premises may be entered. This board or any member thereof may enter upon any premises or go into any building or place where he has reason to suspect there may be diseased animals and examine the same, and may call to his aid, if necessary, the sheriff or any constable of the county in which such animals may be located; and all such officers when so called upon shall assist such board or member thereof in the enforcement of the provisions of this act. Animals in transit in the State are hereby declared to be under the provisions of this act.

Claims for slaughtered animals. SEC. 5. All claims against the State arising from the slaughter of animals, as above provided, shall be made by filing with the secretary of state a copy of the State veterinarian's notice to the justice of the peace, and the return of the appraisers to the justice, which notice and return shall be certified by him. The secretary of State shall examine these, and if satisfied that the amount awarded is just and that the owner of the animals slaughtered is entitled to indemnity, shall issue his warrant for two-thirds of the sum named in such return; but if he shall have reason to believe that the appraised value is greater than the real value of such animals he shall pay such owner such less sum as he may deem just: *Provided*, That the right to indemnity shall not exist nor shall payment be made in either of the following cases: First, for animals owned by the United States, this State, or any county, city, town, or village in this State; second, for animals brought into this State contrary to the provisions of this act, or where the owner of the animal or the person claiming compensation has failed to comply with the provisions of the same; third, when the owner or claimant, at the time of coming into possession of the animal knew, or had good reason to believe, it to be afflicted with a contagious or infectious disease; fourth, when the animal slaughtered was diseased at the time of its arrival in this State; fifth, when the owner shall have been guilty of negligence or has wilfully exposed such animal to the influences of a contagious or infectious disease.

Allowance for experiments. SEC. 6. The State live-stock sanitary board shall be allowed, for experimental purposes, with the consent and approval of the governor, a sum not to exceed five hundred dollars ($500) annually, which bills of expenditure shall be audited and approved by the governor. It shall from time to time issue such bulletins of information as it may deem advisable, which, with the report of the board to be made to the governor in October of each year, shall be printed by the commissioners of public printing, the bulletins in such number as the governor may approve, and one thousand copies of the report of this board, five hundred of which shall be bound.

Assistant veterinary surgeons. The State veterinarian is hereby authorized to call to his assistance, as may be necessary in the performance of his work, duly qualified veterinary surgeons, who shall be paid for their services at the rate of seven dollars ($7) per day and their actual expenses for the time they are actually employed as assistants. Their accounts shall be audited upon itemized vouchers, certified to by the State veterinarian and approved by the governor; but no person shall be considered a veterinary surgeon within the meaning of this act who is not a regular graduate in good standing of some recognized veterinary college in the United States, Canada, or Europe.

Compensation for appraisers, etc. The appraisers herein provided for shall receive two dollars ($2) for each day actually employed as such, which amount shall be paid out of the county treasury, upon the certificate of the justice by whom they were summoned. The justice of the peace and other officers who may perform any duty hereunder shall have the same fees as are allowed by law in criminal proceedings in justice courts, and shall be paid by the county in which their services are performed.

Office supplies. SEC. 7. The superintendent of public property is hereby instructed to furnish the State live-stock sanitary board with the necessary stationery and postage stamps for its work.

Repealing clause. SEC. 8. All acts and parts of acts inconsistent with the provisions of this act are hereby repealed.

SEC. 9. This act shall take effect and be in force from and after June first, 1901.

Approved May 15, 1901.

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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY—BULLETIN NO. 44.
D. E. SALMON, D. V. M., Chief of Bureau.

INFECTIVENESS OF MILK OF COWS WHICH HAVE REACTED TO THE TUBERCULIN TEST.

BY

JOHN R. MOHLER, A. M., V. M. D.,
CHIEF OF PATHOLOGICAL DIVISION, BUREAU OF ANIMAL INDUSTRY.

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1903.

LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Animal Industry,
Washington, D. C., January 2, 1903.

Sir: I have the honor to transmit herewith a manuscript concerning the "Infectiveness of milk of cows which have reacted to the tuberculin test," by Dr. John R. Mohler, Chief of the Pathological Division of the Bureau. The work herein recorded deals with tuberculosis and the tuberculin test in a herd of cattle at St. Elizabeth Asylum, District of Columbia. I recommend that the manuscript be published as Bulletin No. 44 of this Bureau.

Respectfully,

D. E. Salmon, *Chief of Bureau.*

Hon. James Wilson, *Secretary.*

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INFECTIVENESS OF MILK OF COWS WHICH HAVE REACTED TO THE TUBERCULIN TEST.

By John R. Mohler, A. M., V. M. D.,
Chief of Pathological Division, Bureau of Animal Industry.

PRELIMINARY NOTES.

During March and April of 1900 a highly fatal disease appeared among the cattle in the dairy herd belonging to the Government Asylum for the Insane at St. Elizabeth, D. C. Six or seven dry cows died in the course of a few days after exhibiting symptoms which pointed to the central nervous system as being the site of the principal disturbance. A number of other cows became similarly affected, and in the course of two weeks from the beginning of the outbreak eighteen animals had died, when the disease suddenly stopped.

None but dry cows became affected, and the fact that these animals had been kept in a small pasture some distance from the barns where a supposedly rabid dog had been seen among them five weeks before indicated that the disease might be rabies. The pronounced cerebral symptoms—that is, extreme irritability and nervousness, champing of the jaws, excessive frothing at the mouth, paralysis of the pharynx, and wild expression of the eyes—in connection with a noticeable alteration in the voice, and in two cases pronounced paralysis of the hind quarters, seemed to confirm the above diagnosis. Consequently a number of rabbits were inoculated intracerebrally with oblongata emulsion from four of the affected cows, and, with a single exception, all of these rabbits died with characteristic symptoms of paralytic rabies.

The postmortem examination of the eighteen cows in question revealed the fact that tuberculosis prevailed to a great extent in the herd, as at least twelve of the dead animals showed extensive tuberculous lesions. As a result of this it was considered desirable to have the entire herd examined for tuberculosis, and the Bureau of Animal Industry was requested to submit the cattle to the tuberculin test.

This investigation was referred to the Pathological Division of this Bureau, and arrangements were made without delay to carry it into effect. The following report deals with tuberculosis in this herd and not with rabies.

HISTORY AND CARE OF THE HERD.

Owing to the absence of any regularly kept herd book, no accurate knowledge could be obtained regarding the formation of the herd previous to 1865, when it consisted of 1 Jersey bull and 10 Jersey or Jersey grade cows. During that year 3 registered Jerseys—1 bull and 2 cows—were purchased in Pennsylvania, and the herd was gradually increased by raising the heifer calves until it numbered about 40 cows in 1875.

In 1878, 1 bull, 3 cows, and 6 heifers, all full-blood Ayrshires, were purchased from William Lindsay, of New Jersey, for the purpose of eliminating some of the Jersey blood, it being thought that the addition of this more vigorous stock would give better stamina to the herd. Such Jerseys as appeared weak and unthrifty were gradually weeded out and only apparently healthy Jersey cows were permitted to breed. The Ayrshire blood gradually replaced much of the Jersey strain until in 1885, by natural increase and by purchase of grade cows in Virginia and Maryland, the herd consisted of 100 milch cows, 50 heifers, and 3 bulls—2 Ayrshires and 1 Jersey. At this time it was considered one of the best-bred and best-producing herds in this section and was generally admired.

Early in 1888 the Jersey portion of the herd was increased by 7 full-blood cows purchased in Maryland.

On August 28, 1888, a further addition of the Ayrshire blood was made, as the original stock purchased in 1878 seemed to be decreasing and a new strain was thought desirable. Hence 1 bull and 7 cows, all full-blood Ayrshires, were purchased in Meadville, Pa., and from this nucleus originated the large number of Ayrshires which were in the herd in 1900, the Lindsay strain of Ayrshires having practically disappeared.

A departure from the Ayrshire-Jersey cross was made in March, 1890, when a Holstein-Friesian herd, consisting of 1 bull, "Shadeland Ruby's Duke," and 8 registered cows, were purchased.

This accession made quite an impression upon the herd, and during the next ten years the Jersey blood almost disappeared, until in 1900 the herd was nearly one half grade Holstein-Friesians, the other half Ayrshire and grades. On April 9, 1892, the late superintendent purchased 28 milch cows from a dairy farm at Whaylan, Mass.

When these cows arrived they were weak and unthrifty, and many of them were emaciated and had persistent coughs. The dairy attendants thought they had contracted the coughs en route, as they were on the cars for seven days, and during this period the weather was bleak. In the fall of 1892 four of these cows died, the history being that they coughed badly and gradually wasted away. Several of the other cows of this purchase did not thrive, and it is the general supposition that tuberculosis was introduced with this stock.

Occasional deaths among the cattle occurred from the causes usually found on all large dairy farms, and Dr. Blackburn, pathologist of the hospital, has held postmortems on many of these carcasses, but no tuberculous lesions were observed until the outbreak of rabies in 1900.

STABLING.

Two large frame barns were used in which to stable the cattle; the smaller one, known as the dry barn, contained those that were advanced in pregnancy, while the larger one held the milking cows.

The lines of stalls in both stables were so arranged that the cattle faced each other, although in the large barn the distance between them was no less than 7 feet, and in the smaller barn, which contained but two rows of stalls, the runway separating them was over 15 feet wide. In the large barn were two double lines of stalls extending the length of the building. A passageway bisects these lines in such a manner as to make eight rows composed of sixteen cows each. A long continuous manger was in front of each row, from which the cows received their feed, and in winter their water also. The cattle were chained to posts running from floor to ceiling, but were not separated from each other in any way. They could eat each others' food, lick one another—in fact, were in intimate contact. It can readily be seen how a disease brought in by infected animals could be disseminated promiscuously to the adjoining cows of the same line through this system of stabling.

Owing to the absence of sufficient pasture in the vicinity, these animals were stable fed all the year. In the mild season the cows were allowed the freedom of an adjoining lot from 7 a. m. until 2 p. m., when they were stabled for the afternoon's milking, and remained in the barn until morning. During the winter season, if the weather permitted, they were turned out for exercise in the morning.

The feed consisted of the usual dairy ration, containing wheat bran, corn meal or rye middlings, and cut timothy hay, dampened before feeding. Sown forage corn was fed liberally to the cattle during the summer and corn fodder in the winter.

TUBERCULIN-TEST RECORD OF THE ST. ELIZABETH HERD INJECTED AT 10 P. M., MAY 2, 1900.

Temperatures of the 12 cows slaughtered at Benning, D. C., June 15, 1900, before the milk experiment was made.

Number of cow.	Temperature taken.	6 a. m.	9 a. m.	12 m.	3 p. m.	6 p. m.	9 p. m.
No. 410	May 2	102.0	102.3	101.6	102.0	102.8	....
	May 3	102.8	105.0	105.1	106.6	105.4	....
No. 401	May 2	101.6	101.4	101.1	101.3	102.2	....
	May 3	102.2	104.6	103.8	103.2	104.5	....
No. 417	May 2	100.7	101.1	100.8	100.4	102.3	....
	May 3	102.6	104.6	106.3	106.1	104.2	....
No. 376	May 2	101.5	101.1	100.4	100.2	101.1	....
	May 3	105.0	103.1	105.8	105.1	104.0	....
No. 355	May 2	101.4	101.3	101.6	102.0	101.6	....
	May 3	105.0	105.4	106.8	105.2	104.4	....
No. 958	May 2	100.1	101.2	101.0	101.9	101.2	....
	May 3	100.8	101.9	104.0	104.5	104.8	....
No. 393	May 2	102.1	102.1	102.1	102.1	102.2	....
	May 3	102.6	103.6	106.0	106.0	104.9	....
No. 953	May 2	100.2	101.2	100.4	101.6	102.0	....
	May 3	101.2	101.9	101.5	103.2	103.6	102.5
No. 356	May 2	101.4	102.2	101.8	102.0	102.0	....
	May 3	107.8	104.5	106.3	104.8	104.2	....
No. 383	May 2	105.8	106.4	106.0	106.6	106.4	....
	May 3	(a)	(a)	(a)	(a)	(a)	(a)
No. 352	May 2	101.6	101.4	101.5	101.6	101.8	....
	May 3	102.0	102.0	105.0	106.0	104.1	....
No. 942	May 2	100.2	101.5	102.0	101.2	102.4	....
	May 3	101.6	106.2	106.2	106.2	105.2	....

a Not injected.

For postmortem notes on above cattle see page 11.

For the tuberculin records of the 56 cattle which were in the milk experiment, see pages 26 to 78, inclusive.

Record of the temperatures of the remaining cows in the first tuberculin test.

REACTING COWS.

Number of cow.	Temperature taken.	6 a. m.	9 a. m.	12 m.	3 p. m.	6 p. m.
No. 21	May 2	100.8	101.1	101.5	102.9	101.8
	May 3	104.4	104.0	105.8	105.1	105.3
No. 22	May 2	100.6	101.4	101.4	101.7	101.1
	May 3	101.4	102.8	103.6	105.6	104.3
No, 23	May 2	100.3	101.6	101.1	101.4	102.4
	May 3	102.0	103.0	104.9	105.0	105.3
No. 24	May 2	100.6	100.9	102.0	101.8	102.5
	May 3	101.9	101.0	104.6	104.4	103.3
No. 25	May 2	100.9	100.6	101.7	101.8	101.7
	May 3	102.8	104.1	105.0	105.2	104.0
No. 26	May 2	100.3	100.9	101.0	101.4	102.7
	May 3	105.3	107.4	106.2	105.9	105.6
No. 27	May 2	100.6	101.0	101.7	101.3	102.2
	May 3	104.5	106.5	105.9	105.0	104.3
No. 28	May 2	101.0	101.1	101.4	102.2	102.2
	May 3	103.8	104.0	106.6	104.0	103.0
No. 29	May 2	101.7	101.6	101.8	102.7	103.5
	May 3	106.4	104.4	106.6	105.7	103.6
No. 30	May 2	101.6	100.2	100.0	101.0	101.2
	May 3	106.7	104.2	103.2	104.0	102.4

On account of being dry these cows were not used in the investigation of the infectiousness of milk. Their numbers were given subsequent to the tuberculin test.

Record of the temperatures of the remaining cows in the first tuberculin test—Continued.

NONREACTING COWS.

Number of cow.	Temperature taken.	6 a. m.	9 a. m.	12 m.	3 p. m.	6 p. m.
No. 359	May 2	101.4	101.0	101.6	101.8	102.6
	May 3	102.2	100.0	101.4	101.4	101.2
No. 360	May 2	101.1	101.2	102.0	102.0	102.2
	May 3	101.3	100.6	101.2	101.2	101.3
No. 361	May 2	101.6	101.6	101.2	101.8	102.6
	May 3	102.8	100.0	101.7	101.6	102.2
No. 362	May 2	101.8	101.8	102.0	102.2	103.0
	May 3	102.2	100.6	101.2	101.3	101.4
No. 363	May 2	102.2	101.8	102.2	102.6	103.0
	May 3	102.5	101.2	102.0	102.2	102.3
No. 364	May 2	101.2	101.2	102.4	102.0	102.3
	May 3	101.8	100.4	102.2	101.6	101.3
No. 365	May 2	101.4	101.6	102.0	101.8	102.7
	May 3	101.4	100.1	101.0	101.4	101.4
No. 366	May 2	101.5	101.2	102.0	101.6	103.2
	May 3	101.7	100.3	101.2	101.2	103.0
No. 367	May 2	101.0	100.8	101.4	102.0	102.4
	May 3	101.2	100.0	102.2	101.2	101.4
No. 368	May 2	100.8	101.0	102.2	102.0	102.0
	May 3	102.3	100.2	101.2	101.8	101.4
No. 369	May 2	101.4	101.6	101.8	101.6	102.6
	May 3	101.6	101.3	102.3	101.8	101.3
No. 370	May 2	101.8	101.6	102.0	102.4	103.4
	May 3	103.0	100.0	101.0	102.8	102.3
No. 371	May 2	101.4	101.8	103.0	103.4	103.5
	May 3	103.6	103.2	103.2	103.4	103.2
No. 373	May 2	101.3	100.4	100.4	100.4	101.0
	May 3	101.6	100.2	101.6	103.0	102.4
No. 379	May 2	101.9	101.8	101.6	101.8	102.0
	May 3	101.6	101.0	101.7	101.0	101.9
No. 380	May 2	102.0	101.6	101.8	101.6	101.8
	May 3	102.6	101.2	102.6	102.6	102.6
No. 381	May 2	100.6	100.8	101.1	102.8	103.6
	May 3	102.1	101.4	102.8	103.1	102.4
No. 384	May 2	101.5	100.6	101.0	101.1	100.8
	May 3	102.0	101.8	102 0	101.9	101.4
No. 419	May 2	101.0	100.8	101 3	101.3	102.1
	May 3	102.2	102.2	102.8	102.8	102.2
No. 421	May 2	102.0	104.9	102.9	104.0	103.6
	May 3	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)
No. 938	May 2	100.8	101.1	101.4	101.8	101.6
	May 3	101.7	101.9	102.0	102.5	103.3
No. 940	May 2	100.6	100.8	101.2	101.7	101.1
	May 3	100.8	101.6	102.7	103.0	102.2
No. 944	May 2	101.7	101.2	101.6	102.2	103.4
	May 3	103.0	102.4	102.0	102.6	103.3
No. 954	May 2	101.3	101.2	101.2	101.2	102.2
	May 3	101.7	101.3	102.0	101.9	103.0
No. 959	May 2	102.2	102.0	101.8	102.0	102.2
	May 3	101.4	101.0	101.5	102.1	102.1
No. 960	May 2	101.7	102.2	102.0	101.8	102.4
	May 3	101.8	102.4	103 2	103.0	103.0

a Not injected.

RESULT OF FIRST TUBERCULIN TEST.

On May 2 and 3, 1900, the herd, then consisting of 104 head, was tested with tuberculin. Only 2 cows, which showed excessive temperatures previous to the injection, were excluded from the test. One of these was nearing parturition, while the other was affected with traumatic pericarditis caused by the penetration of a foreign body (piece of baling wire) from the reticulum through the diaphragm to the pericardium, and on account of this condition was one of the first 12 to be slaughtered without being tested. Of the remaining 102 head, 76 gave a decided reaction (see table, p. 8), while one cow, No. 953, showed a questionable rise, making the proportion of animals affected more than 74 per cent. Of the 25 animals which did not react, 13 had but recently been purchased from a farm in Virginia and had been kept in one line by themselves in a corner of the barn during the two weeks they had been in the asylum stables. They consequently served as an excellent check on the results of the tuberculin tests. If these 13 animals are excluded, it will be seen that more than 85 per cent of the old herd was tuberculous.

These results demonstrated beyond a doubt that radical measures must be taken at once in order to prevent the infection of the healthy animals, and especially to eliminate those which, on physical examination, were found to be affected with any of the forms of tuberculosis which are especially dangerous for the dissemination of the disease—that is, cavernous tuberculosis of the lungs, tuberculous ulcers of the intestines, tuberculous metritis, and tuberculosis of the udder.

In justification of the superintendent of the farm and barns it should be mentioned that the general appearance of the entire herd was not such as to lead a layman to suspect the extent to which the disease had spread among the animals. In fact, a physical examination of all the animals led to the selection of only 12 head for immediate destruction, and some of these were condemned principally on the testimony of the superintendent to the effect that they had recently begun to fall off to a marked degree or were of no further use to the dairy. A number of these animals were affected to such an extent that their continuation in the stable would mean a continued loss, since their yield of milk in no way corresponded to the cost of their keep, while, on the other hand, their presence in the stable would be a constant source of infection for the other animals. They were, therefore, taken to the public slaughterhouse at Benning, D. C., and destroyed on June 15, 1900. Ten of these animals had reacted to the tuberculin test; 1 (No. 383) was selected owing to the development of symptoms of traumatic pericarditis, while the twelfth cow (No. 953) was the one previously referred to that had shown the only suspicious rise of temperature not considered sufficiently definite to warrant her condemnation. By the test record (p. 8) it is seen that her highest temperature subsequent to the tuberculin injection was 103.6°, a rise of but 1.6° above normal. It was questionable whether this should be regarded as a reaction, and it was decided that the proper course would be to hold her for retest. However, owing to her general unthriftiness and the presence of chronic mastitis, which made the animal unfit for dairy purposes, she was destroyed at once.

A careful postmortem examination showed that the 10 reacting animals were affected with tuberculosis to a greater or less extent, while the cow giving the questionable rise of temperature showed only three encapsulated tuberculous centers, the size of hemp seeds, in one of the mesenteric glands. This gland was removed for the purpose of inoculating the tuberculous material into guinea pigs in order to test its virulence, but unfortunately it was mislaid in collecting the specimens to be brought to the laboratory. Of the 10 reacting cows 5 were found to be unfit for food, while the tuberculous alterations in the other 5 were confined to the lymph glands or else localized in such a way as to admit of complete excision and the passing of the carcasses for food. The cow which failed to give a precise reaction was also passed, while the twelfth cow (No. 383) was condemned owing to the presence of both tuberculosis and traumatic pericarditis.

A brief description and postmortem report of these cattle follow:

No. 410. Holstein raised on farm; 6 years old; delicate and unthrifty in appearance; glands apparently normal on examination; right lung slightly affected; bad cough; weight, 750 pounds.

Postmortem.—Miliary tubercles throughout both lungs, more numerous in caudal lobe of right lung. All mesenteric glands enlarged, some being as large as a hen's egg, and show various degrees of tuberculous degeneration. Fresh tubercles on peritoneal covering of liver.

Carcass condemned.

No. 401. Common stock; 7 years old; bought six months ago; in fair condition; becoming unthrifty; appetite poor; no milk; not wanted by farm superintendent; weight, 850 pounds.

Postmortem.—One small nodule the size of a pea in right ventral lobe of lung. Posterior mediastinal glands greatly affected and calcareous.

Carcass passed.

No. 417. Blue-spotted, common stock; 8 years old; bought three years ago; delicate; capricious appetite; thin condition; not wanted in herd; weight, 790 pounds.

Postmortem.—A few small encapsulated foci in both lungs. Both retropharyngeal glands the size of hens' eggs, and containing thick yellow pus. Right supramammary lymph gland greatly enlarged, but contains no tuberculous focus.

Carcass passed.

No. 376. Yellow, common stock; 7 years old; bought five years ago; in poor condition and becoming unthrifty; physical signs of tuberculosis present; sibilant râles; weight, 660 pounds.

Postmortem.—Extensive tuberculosis of both lungs. Bronchial and mediastinal glands all enlarged and completely degenerated. Both retropharyngeal glands the size of a hen's egg, containing pus. One mesenteric gland is swollen and contains a caseous tuberculous mass.

Carcass condemned.

No. 355. Grade Jersey; 14 years old; raised; losing flesh despite good appetite; left submaxillary gland enlarged; numerous râles distinctly heard in both lungs; weight, 660 pounds.

Postmortem.—Both lungs contain numerous nodules throughout the parenchyma, with two or three abscesses opening into bronchi. Extensive tubercular pericarditis and pearly disease of the pleura. Bronchial and mediastinal glands completely broken down. Left submaxillary gland and both retropharyngeal glands are enlarged and contents degenerated. Entire chain of mesenteric glands are extensively involved.

Carcass condemned.

No. 958. Jersey grade; 5 years old; bought two years ago; dry and not with calf; no use for dairy; weight, 775 pounds.

Postmortem.—Numerous small tuberculous foci in ventral and cephalic lobes of right lung. Mesenteric glands normal. Several abscesses in liver about 2 inches in diameter, but not of tuberculous nature.

Carcass passed.

No. 393. Grade Ayrshire; 9 years old; bought five years ago; in poor condition; physical symptoms apparent; weight, 950 pounds.

Postmortem.—The cephalic lobes of both lungs contain broken-down nodules and one large focus containing pus is seen in the right ventral lobe. Right bronchial gland normal in size, but presents a tubercular focus. Entire mesenteric chain affected; areas not very large, but numerous and calcareous. Supramammary gland as large as a duck's egg and watery, but did not show tubercle bacilli in cover-glass preparations.

Carcass condemned.

No. 953. Red grade; 7 years old; bought one year ago; chronic mastitis in one quarter of udder; poor feeder and in thin condition; not wanted by farm superintendent; weight, 675 pounds.

Postmortem.—Three small, well-defined foci the size of hempseeds in one of the mesenteric glands.

Carcass passed.

No. 356. Ayrshire grade; 10 years old; bought five years ago; very poor condition; shows typical signs of tuberculosis; weight, 725 pounds.

Postmortem.—Caseous tubercular area in posterior and lower portion of main lobe of right lung. Cephalic lobe consists almost entirely of a soft caseous mass. Left lung contains tuberculous nodules with calcareous centers in upper and posterior portion of main lobe. Both bronchial and anterior and posterior mediastinal glands contain cheesy masses and are three or four times their natural size. About twenty-five tuberculous foci scattered throughout the liver. Two nodules the size of peas in spleen. Udder is tuberculous, containing localized indurations with tubercles and ulcerations on the mucous membrane of the lacteal canals, especially in the left posterior quarter, but supramammary glands are apparently normal.

Carcass condemned.

No. 383. Holstein grade; in fair condition, but has developed characteristic symptoms of traumatic pericarditis. It was considered advisable to slaughter this animal at once, although she had not been subjected to the tuberculin test on account of pyrexia.

Postmortem.—Both lungs show caseous nodules scattered through the pyrenchyma. Bronchial and mediastinal glands greatly enlarged and degenerated. Submaxillary and retropharyngeal glands calcareous. A large fibrous tumor attaching the diaphragm to the reticulum and pericardium is seen embedding a piece of wire three inches in length. The tumor contains pus of a putrid odor.

Carcass condemned.

No. 352. Brown-and-white common stock; eight years old; not in milk; not pregnant; appetite capricious; no use to dairy; submaxillary glands about the size of walnuts; weight, 775 pounds.

Postmortem.—Submaxillary and retropharyngeal glands are all greatly enlarged and contain calcareous foci of tuberculosis. Liver shows three or four greenish abscesses about two inches in diameter, but not of a tuberculous nature.

Carcass passed.

No. 942. Red speckled, common stock; 7 years old; affected with chronic nymphomania; bought fresh three years ago, but has not been pregnant since; no further use to farm superintendent.

Postmortem.—One small well-defined tuberculous nodule in ventral lobe of left lung. Right and left bronchial lymph glands are as large as hens' eggs and have undergone caseous degeneration. Cephalic lymph glands normal.

Carcass passed.

DISINFECTION AND ISOLATION.

The general appearance of the herd, after the removal of the above-mentioned 12 individuals, a number of which showed more or less decided symptoms on physical examination, was quite satisfactory. It would, in fact, have been impossible to find any fault with the condition and appearance of the remaining cows. As before mentioned, there were two large well-ventilated stables 200 or 250 yards from each other, and it was, therefore, an easy matter to provide new quarters for the nonreacting animals. For this purpose the smaller barn was selected; and, in order to avoid a repetition of the extensive spread of the disease, great care was exercised in subjecting the premises to a thorough disinfection and renovation. The boards on the floors were scraped with hoes and were replaced where necessary; the floor, walls, ceiling, stalls, mangers, in fact, the entire stable, was cleaned first with hot water, then with a strong creolin solution. The woodwork was painted, and antiseptic whitewash applied to the brick and stone wall which formed one side of the stable. The old mangers were replaced by modern individual troughs, and the stanchions were constructed in such a manner as to make it impossible for the animals to get their heads together. When this work had been accomplished the 26 nonreacting cattle were stabled there, leaving 66 cows in the infected barn.

From this time the tubercular herd was kept strictly isolated from the healthy cattle and was supplied with separate attendants, dairy utensils, and such other details as were requisite for carrying out this purpose of segregation. The milk of the infected herd was submitted to the boiling temperature for 30 minutes before using, and every precaution was taken in the care of the animals to prevent their rapid decline.

PREVIOUS EXPERIMENTS WITH TUBERCULOUS MILK.

As the question of the infectiousness of milk from tubercular cows was then, as it is now, one of great importance, and as the opinions of the scientists who are recognized as authorities on such matters differ greatly regarding this subject, it was decided to take advantage of the opportunity which had presented itself and ascertain, so far as possible, to what extent the milk of the remaining tubercular, or reacting, cows contained tubercle bacilli. That milk coming from a tuberculous udder is capable of transmitting infection to experimental animals is conceded by all who have given the subject any consideration. It has been equally well established that in advanced generalized tuberculosis the udder may excrete tubercle bacilli without showing any indication of being affected. Careful experiments performed by trained and eminently responsible investigators have also demonstrated beyond reasonable doubt that the tubercle bacillus may at certain times enter the general circulation and be eliminated by the normal mammary gland of cows in which the disease is localized or in an incipient stage. Among the earliest investigations which proved positively that milk from tubercular cows contained an infectious principle were those of Gerlach (1869), who produced tuberculosis in calves, hogs, sheep, and rabbits by experiments in feeding, although clinical experience and observation of natural cases had previously led others to form the same opinion.

As early as 1850 the pathological anatomy of the tubercle occurring in the udders of tubercular cows was described by Gluge, and he also spoke of the probability of the milk from such udders transmitting the disease to calves.

Zurn (1872) obtained positive results by feeding swine with the milk of a cow affected with tuberculosis.

Klebs (1873) fed the milk of a tubercular cow to 5 guinea pigs, a dog, and a goat, with the result that 4 of the guinea pigs and both the dog and goat became tubercular. Three guinea pigs injected intra-abdominally with milk filtered through clay all died with lesions of tuberculosis. He concludes that the tuberculous virus is probably present in varying quantities in the milk of cows both greatly and slightly affected.

Semmer (1875–76) inoculated guinea pigs, sheep, and rabbits, some intravenously and others subcutaneously, with the milk of tuberculous cows and produced tuberculosis in 5 out of 11, or 45.4 per cent, of these animals.

Bollinger (1880) infected 1 out of 3 hogs which he fed on the milk of a tuberculous cow. The milk of another cow was fed to 5 hogs, with the result that they all died of tuberculosis. Neither of these cows showed tuberculosis of the udder. Another experiment, in which 6 pigs were used—2 fed cooked milk, 2 uncooked milk, and 2 control pigs—resulted in the death of the 2 animals fed on uncooked milk from a tuberculous cow, while the postmortem examination of the 2 checks and the 2 hogs fed cooked milk showed a normal condition, except an abscess in the liver of one of the last-mentioned hogs. This scientist was the first (1883) to positively establish the virulence of the secretions from a tuberculous udder. In 1883 May inoculated experimental animals with 1½ to 10 c. c. of whole milk which he obtained from the udders of 6 tuberculous cows after they had been slaughtered. The milk from one udder, or 16.6 per cent, transmitted the disease, and in this case the mammary gland was found to be tuberculous.

Johne (1883) has compiled the results of previous feeding experiments with milk of tubercular cows, and, after carefully eliminating questionable investigations, found that of 91 animals fed with this milk, 30.7 per cent became infected with tuberculosis.

Stein (1884) investigated the infectiousness of milk from 14 cows affected with generalized tuberculosis. Of this number 4, or 28.5 per cent, produced tuberculosis by intraabdominal inoculations of the milk into guinea pigs. The udders macroscopically appeared to be normal, but a microscopic examination of the tissues showed the presence of the tubercle bacillus in one of them.

Zschokke (1884) produced tuberculosis in 2 rabbits with the milk of a tubercular cow whose udder did not show any evidence of tuberculosis. His method of inoculation was a combination of the intraperitoneal injection and inhalation by spraying. Both rabbits having developed lesions of the abdominal cavity without any apparent pulmonary alteration proved the former method to be more efficient.

Imlach (1884) fed the milk of 3 tubercular cows to 3 calves, 4 pigs, 1 goat, 2 monkeys, and guinea pigs, with the result that only the monkeys developed experimental tuberculosis.

H. Martin (1884) made a study of the milk sold in Paris dairies. Of 13 samples examined 4 were without results; of the remaining 9, 3, or 33.33 per cent, were found to contain virulent tubercle bacilli by the inoculation of guinea pigs.

Wesener (1885) published the results of previous feeding experiments, 86 in number, conducted for the purpose of determining the infectivity of milk from tubercular cows. The milk was fed to 2 calves, both of which developed tuberculosis, while 75 per cent of the hogs and 50 per cent of the goats and sheep that were likewise fed also became tubercular; 40 per cent of the guinea pigs gave positive results, but rabbits gave very unsatisfactory, and the cats positively negative, results in these feeding experiments.

Bang (1885) in his experiments with milk from cows with tubercular udders produced the disease in 3 rabbits and 5 pigs by feeding. Four rabbits were inoculated with the skim milk from these cows and they all became infected. Microscopic examination of the sediment showed many tubercle bacilli, while a few were also observed in the milk and cream. Subsequently (1889) he tested the milk of 21 tuberculous cows with normal udders by inoculating 48 rabbits. Two, or 9.5 per cent, of these cows transmitted the disease. Later (1892) he injected 40 guinea pigs with milk from 28 cows affected with generalized tuberculosis and showed that virulent milk was being secreted by 4 of the animals, 3 of which were found to have lesions in the udder on postmortem examination. By intraabdominal inoculations of 28 guinea pigs with the milk of 14 tuberculous cows he found that 3 of the latter were excreting tubercle bacilli in the milk. The summary of these experiments shows that of 63 cows 9 gave virulent milk, and of this number 3 had tuberculous udders, leaving 9.5 per cent of the cows with normal udders producing infectious milk. He concludes that in a majority of cases milk from tubercular cows with healthy udders is not necessarily dangerous, but should be regarded with suspicion.

Galtier (1889) failed to produce tuberculosis in 4 rabbits inoculated with milk from a tubercular cow with a normal udder. In a later experiment he obtained positive results from inoculating a rabbit with milk from an udder but slightly tuberculous. From this he claims that tuberculosis is found only when the udder is affected, but nevertheless believes that milk from all tubercular cows should be suspected.

Peuch (1889) injected 4 rabbits intraabdominally and fed 1 young pig with the milk of a cow having a tuberculous udder. All the rabbits developed generalized tuberculosis, but the pig resisted the exposure. In a previous experiment 2 pigs and 2 rabbits were fed the milk of a tubercular cow, and all became affected.

In the investigations of Hirschberger (1889) this author proved by intraabdominal inoculations of guinea pigs that the milk from 11 out of 20 cows, or 55 per cent, contained the tubercle bacillus. He placed his cows in three groups: the first were generalized cases, of which 80 per cent killed the guinea pigs with tuberculosis; the second were not so badly infected, but 66 per cent producing tuberculosis in the inoculated animals; while the third group contained cows that had lesions localized in the lungs, only 33 per cent of which group gave positive results. In a microscopic examination of the milk from the 11 cows that transmitted the disease, tubercle bacilli could be found in only one case.

Gebhardt (1890) has demonstrated the effect of dilution on the virulence of tuberculous milk. In the first series of experiments 5 guinea pigs were inoculated with milk from a tuberculous cow, as follows:

First with 2.5 c. c. undiluted.	
Second with 2.5 c. c. of a dilution of	1 to 20
Third with 2.5 c. c. of a dilution of	1 to 40
Fourth with 2.5 c. c. of a dilution of	1 to 50
Fifth with 2.5 c. c. of a dilution of	1 to 100

The 2 guinea pigs receiving the undiluted and the 1-to-20 dilution of milk became tubercular. This experiment was twice repeated with practically the same results, from which fact he concludes that a certain degree of dilution (1 to 50) produces a marked diminution in the virulence of tuberculous milk. He also inoculated 10 guinea pigs intraabdominally, each receiving 2 c. c. of milk bought in Munich, with negative results.

J. McFadyean and Woodhead (1892) proved by the inoculation of milk from nontubercular udders, and of an emulsion prepared from the tissue of similar udders, that 2 cases (1 milk and 1 udder) out of 13 in all, or 13.3 per cent, contained the tubercle bacillus.

Fiorentini (1892) conducted 48 milk experiments by inoculating 76 guinea pigs and 4 rabbits. Of these 1 rabbit and 4 guinea pigs became tubercular. It was found on postmortem that 2 of the 17 cows producing the milk were affected with udder tuberculosis.

The previous experiments performed in this laboratory by Smith and Schroeder in 1893, and later by Schroeder (1894), also show the infectious nature of milk from tubercular cows. The first experiment resulted in producing tuberculosis in 41 per cent of the guinea pigs inoculated intraabdominally with the milk from 6 cows affected with generalized tuberculosis. The diseased guinea pigs were inoculated with the milk from 2 of the 6 cows; in other words, 33.33 per cent of the cows were secreting tuberculous milk. The later experiment by Schroeder was divided into three parts. The first, in which market milk from unknown cows was injected into guinea pigs, showed that 1 of 19 samples, or 5.2 per cent, produced tuberculosis in one of the experimental animals inoculated with it. The second was conducted with milk from 12 tubercular cows that had either given a reaction to tuberculin or evinced physical symptoms of the disease. By intraabdominal injections of the sediment of the milk into guinea pigs 1 cow, or 8.3 per cent, was found to be secreting tuberculous milk. The third series consisted in repeated injections intraabdominally of milk from 4 tubercular cows without obtaining any positive results.

In a bacteriological study of St. Petersburg milk, Sacharbekow (1893) inoculated 80 guinea pigs intraabdominally with 4 c. c. each. Four of the animals, or 5 per cent, died as a result of the tubercle bacilli in the milk.

Ernst (1890–1895), in conjunction with Peters, conducted an extensive experiment with the milk of 36 cows that apparently were without any affection of the udder. A microscopic examination of 121 slides made from the milk of these cattle showed 19 slides, or 15.7 per cent, to contain the tubercle bacillus. These 19 slides represented the milk from 12 of the cows, or 33.3 per cent, that were secreting tuberculous milk. Rabbits were injected subcutaneously with the milk and cream from 19 of these cows, 4 of which, or 21 per cent, transmitted the disease. The milk of 15 cows was subcutaneously inoculated into guinea pigs, with the result that 6 cows, or 40 per cent, were found to be excreting tubercle bacilli. By combining the entire number of cattle in this herd that was shown to possess tuberculous milk, it was demonstrated that at one time or another the milk of 50 per cent of the cows proved infectious. This author also fed 21 calves on the milk of 25 tubercular cows and produced tuberculosis in 8, or 38 per cent, of them. The same milk when furnished to 12 pigs caused tuberculosis in 5, or 41.6 per cent, of the animals. The feeding experiments with rabbits resulted in the death of 2 animals, or 4 per cent, from tuberculosis. Twenty-three of the cows whose milk was fed in this investigation were slaughtered and all but 1 showed perfectly healthy udders on microscopic examination. In a subsequent experiment Ernst inoculated 25 rabbits with the market milk of Boston and 3, or 12 per cent, developed tuberculosis.

De Man (1893), in a series of experimental investigations for the purpose of demonstrating the influence of temperature on the tubercle bacillus, found that 8 guinea pigs inoculated with the emulsion of 4 tuberculous udders contracted tuberculosis.

In the suburbs of Copenhagen St. Friis (1893) obtained milk from 44 dairies each composed of 10 to 80 cows, and made 46 experiments with 84 rabbits and 4 guinea pigs. Of this number 37 rabbits and 4 guinea pigs died a few days after as a result of septic peritonitis, which left only 26 experiments to show final results. Four of these experiments killed 6 rabbits, and it was found later that the 2 dairies furnishing the samples of milk which caused the death of 2 of these rabbits had, respectively, 20 and 30 cows in the herds, 3 of which were affected with udder tuberculosis. The dairies supplying the milk that killed the other 4 rabbits were composed of cows with no apparent lesions of the udders. He also fed 2 rabbits for four months with dairy milk with negative results. The next year this author (1894) reports that of 33 samples of milk obtained from various dairies in Zealand none produced tuberculosis by inoculating laboratory animals.

Pearson (1893) produced tuberculosis in 2 pigs by feeding the milk of a cow which on postmortem showed pulmonary tuberculosis, but no udder lesion. Control pigs gave negative necropsies.

Law (1894) succeeded in infecting 3 calves from healthy parents with the milk of 3 cows affected with generalized tuberculosis but with apparently sound udders.

Hills and Rich (1894) found tuberculosis in a number of hogs that had been fed milk from a herd, 85.7 per cent of which were proved tubercular on postmortem examination, but without udder lesions.

Russell (1894) experimented with the milk of 7 tuberculous cows by inoculating rabbits. One cow, or 14.2 per cent, gave milk which killed both of the inoculated animals. The microscopic examination of the udder of this cow revealed the presence of the bacillus of tuberculosis.

Nocard (1896) obtained positive results in 3 out of 54 cases, or 5.5 per cent, by using milk from cows with advanced generalized tuberculosis. On further examination the udders of all 3 revealed tubercular lesions. He also claims (1884–1885) that the milk of tubercular cows will not transmit tuberculosis unless the udder is tuberculous. He examined the milk from a cow affected with advanced generalized tuberculosis, but found no tubercle bacilli present.

Obermüller (1897) injected small quantities of centrifugalized sediment of mixed milk into experiment animals and produced tuberculosis in 38 per cent of the animals. Later, 14 samples of butter made from the milk of these cows were injected into guinea pigs, resulting in the development of tuberculosis in every case.

The virulence of the market milk of Genoa, Italy, was studied by Massone (1897) by intraabdominal injection of guinea pigs, and it was found that the milk in 9 per cent of the samples contained virulent bacilli. The report of the medical officer of health of Liverpool to the Health Commission for 1897 records the examination, by the microscope and by inoculation experiments, of 158 samples of milk from different sources. Of 122 samples of city milk, 3, or 2.4 per cent, were found tuberculous. Of 24 specimens of country milk procured at the railway stations, 7, or 29.1 per cent, contained the bacillus of tuberculosis.

Delepine (1897) injected 36 samples of milk from Liverpool into guinea pigs, and found 1 sample, or 2.8 per cent, to contain the tubercle bacillus. In another series of experiments 2 out of 9 samples of milk from Liverpool were shown to be infectious to guinea pigs. This author also inoculated milk direct from the udders of 24 tuberculous cows, and found that 6, or 25 per cent, of the number produced tuberculosis in the guinea pigs. In a later article Delepine (1901) gives a table of the results obtained by inoculating guinea pigs with the milk of tubercular cows since 1896, and shows that 22.2 per cent of the cattle transmitted the disease.

Further evidence has been furnished by Ravenel (1897), who investigated the infectiousness of mixed milk from 5 tubercular cows with healthy udders by intraabdominal inoculation of guinea pigs. In 3 series of experiments, in which the milk was injected in its natural condition, 10 out of 66 guinea pigs, or 15.8 per cent, contracted tuberculosis as a result of the injection.

Petri (1898) injected 478 guinea pigs with 64 samples of the market milk of Berlin. In this investigation positive results were obtained in 9, or 14 per cent, of the cases, while 4, or 6.3 per cent, showed the acid-proof bacillus.

Beuge (1898) inoculated 18 guinea pigs intraabdominally with milk obtained in Halle. Eight of these animals died within a few days with septic peritonitis, while of the remaining 10 there were 3, or 30 per cent, that developed tuberculosis.

Ott (1898) proved that out of 43 samples of mixed milk 5, or 11.6 per cent, were infected. Ten guinea pigs each received intraabdominally 5 c. c. of mixed cream and sediment from the above 5 sources and 7 became tubercular. Of 30 guinea pigs inoculated with 5 c. c. of the whole milk 2 died of peritonitis, 4 died as a result of tuberculosis, while the postmortem examination of 4 others that died of intercurrent diseases showed lesions which contained the tubercle bacillus, making 8 out of 28, or 28.5 per cent, tuberculous.

Kudinow (1898), in a study of the microorganisms present in the market milk of Dorpat, found by intraperitoneal inoculations of guinea pigs that 2.5 per cent of the samples contained the tubercle bacillus and concluded that the percentage was even greater, since many of the animals died as a result of other pathogenic bacteria in the milk before the tubercle bacillus had an opportunity to produce extensive lesions.

Kanthack and Sladen (1899) report that out of 16 dairies supplying 10 English colleges with milk 9, or 56.2 per cent, contained virulent tubercle bacilli. In this experiment 90 guinea pigs were used, 23, or 25.5 per cent, of which showed typical histological lesions. Thirteen of these were inoculated with cream, while 10 received injections of the centrifugalized sediment.

A. MacFayden (1899) examined 100 samples of the milk supply of Hackney district. Twenty-three of these samples caused peritonitis in the inoculated animals before tuberculous lesions could be established, while in the remaining 77 samples 17, or 22 per cent, produced tuberculosis.

Ostertag (1899) contends that the infection is to be considered only when the cow is sensibly affected, and in order to obtain evidence of the bacilli in milk of cows that do not show clinical symptoms, this investigation was undertaken. In the first experiment with the individual milk from 49 cows but 1 guinea pig died of tuberculosis, and this animal, the author claims, must have been infected before receiving the inoculation of milk. In another experiment with the mixed milk from this herd, 14 samples were used with the result that 1 of these samples, or 7.1 per cent, transmitted tuberculosis to 1 of 3 guinea pigs intraabdominally inoculated with the cream sediment. From this the author states: "The result of our second experiment plainly shows that in latent tuberculosis tubercle bacilli will occasionally find their way into the blood channels and from this source they may be carried through the milk into the outer world." At the same time he concludes that the milk of such cows offers no serious menace to the public health.

In direct opposition to this conclusion are those of Rabinowitsch and Kempner (1899), who succeeded in producing tuberculosis in guinea pigs with the milk of 10 out of 15 tuberculous cows, or 66.6 per cent. Two of these cows were later found to have tuberculous udders, 3 showed advanced generalized tuberculosis, while the remaining 5 animals were but slightly affected. The writers conclude that milk from cows with incipient tuberculosis, but without disease of the udder, may contain tubercle bacilli; also in latent forms of tuberculosis the milk may prove infectious, although the cow may not present any clinical symptoms of tuberculosis, and therefore milk from all cows reacting to tuberculin should be considered as at least suspicious.

In 1897 Rabinowitsch showed by intraperitoneal injections of guinea pigs that 7, or 28 per cent, of the 25 samples of Berlin milk tested contained nocuous tubercle bacilli. This writer (1900) also studied the unsterilized milk of Berlin firms who sell their product at increased prices especially for the use of infants and invalids. Three of these dairies contained tuberculin-tested cows, while the remaining 5 were not subjected to such strict veterinary supervision. By intraperitoneal inoculation of guinea pigs it was observed that the milk of 3 of these 5 dairies possessed living virulent tubercle bacilli.

Adami (1899) believes that the cells of an actively secreting mammary gland of a cow can take up and discharge the tubercle bacillus without the animal showing any lesion of the lacteal tract. He and Martin examined the milk of 10 cows and when these were killed the udders were subjected to microscopic examination with negative results. In the milk of 6 (60 per cent) of these cows tubercle bacilli were observed by the aid of the microscope. The milk from the cow showing the greatest number of bacilli was inoculated into 2 guinea pigs and both died as a result of the infection. Twenty-nine guinea pigs and 26 rabbits were inoculated with varying quantities of milk and 1 calf was fed for five months, but only 2 guinea pigs died of tuberculosis.

Roger and Garnier (1899) injected the milk of a tubercular cow without udder lesions into the peritoneal cavity of 2 guinea pigs. They both contracted tuberculosis. The calf of this cow was allowed to suckle for only two days, but six weeks later it died with tuberculous lesions of the mesenteric lymph glands, the liver, spleen, and kidney.

In an article on tuberculosis, Annett (1900) publishes the results obtained by Boyce, who in 1898 examined 84 samples of Liverpool milk, of which 7, or 8.5 per cent, produced tuberculosis when inoculated into guinea pigs. In the study of 28 samples of country milk, 5, or 17.8 per cent, proved virulent to guinea pigs. In 1899, Boyce repeated these experiments, using 75 samples of town milk and 63 specimens of country milk, with the result that 6.6 per cent and 17.4 per cent, respectively, of these milks produced tuberculosis.

Marcone (1900) demonstrated the virulence of Naples milk by intraperitoneal inoculation of guinea pigs. Two series of experiments were conducted with the milk of 100 cows. In order to avoid a long series of experiments with each cow's milk separately, he collected the milk of several cows to form a single sample for study, so that the milk of the hundred cows was divided into 14 samples. In the first test of these samples 2 failed to give results, 6 gave positive, and 6 negative, or 50 per cent produced tuberculosis. In the second series of researches the results were similar, since 7 gave positive and 7 negative findings.

Gehrman and Evans (1900) found tubercle bacilli in the milk of 15 out of 41 cows with sound udders, or 36.6 per cent. Guinea pigs inoculated with milk from 10 of these cows died of tuberculosis (24.3 per cent). As these results were not obtained from the same cows, the final showing is that 16 of the cows at one time or another gave milk containing tubercle bacilli, or 39.02 per cent. In 1895 Gehrman demonstrated by the microscopic examination of the milk of 38 cows with normal udders that 4, or 10.5 per cent, contained the tubercle bacillus. Subcutaneous inoculation of guinea pigs established the virulence of the tubercle bacillus in the secretions of 6, or 15.7 per cent, of the cows.

The most casual examination of the evidence deduced from these numerous experiments, performed by the leading investigators of many countries, shows clearly the danger to a susceptible subject of milk from a cow affected with tubercular mammitis or with advanced generalized tuberculosis which may be recognized by physical examination. The observations and deductions regarding this group of cases are practically uniform and the contradictory opinions appear to be relative to the possibility of a tuberculous cow with a healthy udder and without clinical appearances of the disease producing infectious milk. In the latter instance the evidence seems to be that the milk of such tubercular animals is capable of transmitting tuberculosis, the controversy relating more to the percentage of positive results obtained than to the diverse opinions of these investigators. While the tuberculin test can not be considered as an exclusive method for determining the infective property of milk, still the milk from cows which have given no other evidence of the presence of tuberculosis has, in a number of instances above related, produced the disease in susceptible animals. It has also been demonstrated and accepted by the majority of these writers that the infectivity of the milk of tuberculous cows increases with the stage and extent of the disease, as would be expected, but, on the other hand, the experiments of Gebhardt have shown that the danger of infection is diminished by mixing the milk of a number of cows together so that any infected sample becomes diluted.

In view of the evidence above submitted, it is apparent that the conclusion which maintains a sharp line of demarcation between the time immediately before the tubercle bacilli find lodgment on the susceptible mucous membrane of the lacteal tract and the period directly after such involvement occurs with the consequent pathological changes can not be considered as logical. Moreover, histological, bacteriological, and inoculation tests have disproved such reasoning and have fully demonstrated that the bacillus of tuberculosis may be eliminated by the blood through the mammary gland without this organ becoming affected. Despite these valuable contributions to our knowledge of the infectiousness of milk from tuberculous cows, and although the study has been prosecuted for many years, there are many problems yet unsolved, and this most important subject still warrants additional experimentation and investigation to ascertain accurately and establish firmly the disputed points.

PRESENT INVESTIGATION.

For the reasons already mentioned and in consequence of the direct relation which tuberculous milk bears to human health, as well as to determine more definitely the relation which exists between the clinical aspect of the cows which have reacted to the tuberculin test, but which on physical examination are apparently healthy, and the infectivity of their milk, it was decided to ascertain, through feeding and inoculation experiments, whether the milk from the cows in question contained virulent tubercle bacilli, and, if so, to what extent. Samples of milk were therefore obtained in a sterile bottle from each cow once a day and carried immediately to this laboratory. Fifty-two of the 66 reacting cows were in milk, while the remaining 14 were dry, but subsequently 4 of these animals came in milk and were included in the experiment.

TECHNIQUE OF MILK INOCULATIONS.

METHOD OF WORK.

All milk used in these experiments was obtained about 2 o'clock daily, and consisted of the first portion of the milking, excluding the first few streams, which were always discarded in collecting the samples. Half-pint bottles were used in carrying the milk for the feeding experiments, and they were supplied with tight-fitting metallic covers. These bottles were always sterilized in the laboratory on the morning of the day on which they were to be used. The teats and udders were dampened with a 2 per cent solution of creolin, and, if possible, even more careful precautions were observed in securing the milk from the cows for intraabdominal inoculation. The milk for this purpose was collected in 1-liter serum bottles from but 2 cows a day. The bottles were then placed in the ice chest over night in order to allow the formation of cream. The following morning the cream was removed with a sterilized pipette, shaken up with twice its volume of sterilized water, and centrifugalized by electricity for 15 minutes at the rate of about 2,500 revolutions per minute. This apparatus was devised by replacing the hub and blades of an electric desk fan by the shoulder and arms of the medical hand centrifuge. This centrifugal machine was attached to the wall in an inverted position and encircled with a sheet of galvanized iron to prevent injury to the manipulator. With this electric apparatus work was made less laborious and also gave a more constant and uniform precipitation of the milk than could have been accomplished otherwise. The sediment obtained was then injected into guinea pigs after the supernatant fluid had been drawn off with a sterile pipette.

After the cream had been removed from the original bottle for centrifugalizing, the milk was siphoned off to within 6 to 8 cm. of the bottom of the jar. This portion containing the sediment was drawn up with a sterile pipette and emptied into the tubes of the centrifugal machine. It was then subjected to the same treatment as the cream. In all cases from 4 to 6 cover-glass preparations were made from the centrifugalized sediment of both the milk and the cream, and examined microscopically after staining by Ziehl-Nielsen's method. All the injections were made into the peritoneal cavity of the guinea pigs after adhering to the usual aseptic precautions. The hair was clipped from a small area in the abdominal region, after which the skin was thoroughly carbolized, washed with alcohol, and rinsed with sterilized water.

The quantity injected varied somewhat, the first twelve receiving from 1 to 2 c. c., after which the amount was increased from 2 to 3 c. c., and still later as high as 5 c. c. was introduced into the abdomen. The milk was gathered by one of the laboratory assistants thoroughly acquainted with the precautions that should be observed in procuring it. As a rule, within one hour after it had been collected the milk would reach the laboratory and the contents of the small bottles fed at once to the guinea pigs, while the large bottles containing the milk for injection were kept on ice until the following morning. Three guinea pigs were assigned to each cow for the feeding experiments. In the inoculation tests 3 guinea pigs were usually injected in the first and 4 in the second series. The animals used in this investigation were in good condition and weighed from 11 to 19 ounces. They were obtained some from our own breeding pens and others from a well-known breeder with whose premises we are perfectly familiar. Spontaneous tuberculosis has not been known to occur in either place. Owing to an unfortunate circumstance it was possible to hold a post-mortem on 16 animals from the last-mentioned pens before the milk experiment had started, and this examination did not reveal any evidences of tuberculosis.[a] All the animals in these experiments were placed in new cages and every known precaution was observed to prevent contamination from external sources. When deaths occurred the organs were carefully examined, cover-glass preparations made of the lesions, and the affected tissues preserved in Kaiserling's fluid. Owing to the more or less uncertain results obtained from making cultures, this procedure was dispensed with after a short trial, but in many cases the microscopic findings of the tubercle bacilli in sections

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[a] A number of guinea pigs had been placed in a box awaiting the arrival of some new cages, and inadvertently had been covered with other boxes, which, together with the extreme hot weather then present, caused 16 of them to be asphyxiated.

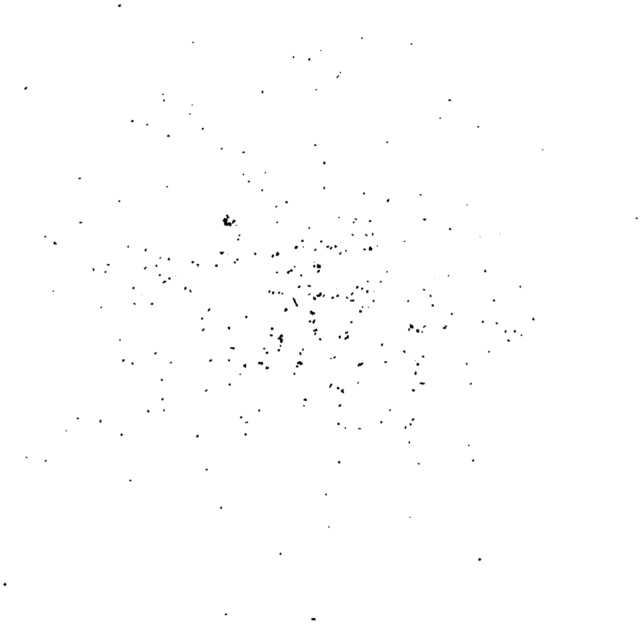

Fig. 1.

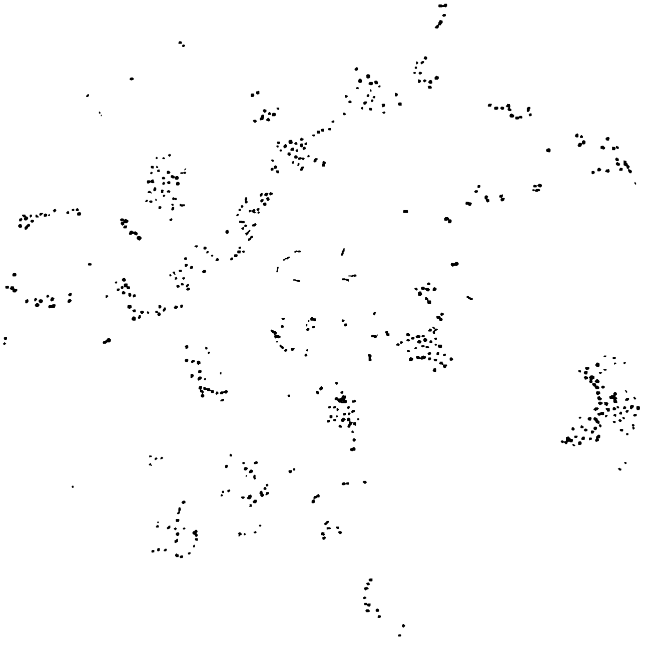

Fig. 2.

TUBERCLE BACILLI IN NATURAL AND CENTRIFUGALIZED MILK PREPARATION.

DESCRIPTION OF PLATE I.

Fig. 1. Cover-glass preparation of the uncentrifugalized milk of cow No. 102. Stained by Ziehl-Nielsen's method. Drawing made with Zeiss 2 mm. oil immersion objective and No. 4 compensating ocular.

Fig. 2. Cover-glass preparation of the milk sediment from cow No. 102. Stained by Ziehl-Nielsen's method. Drawing made with Zeiss 2 mm. oil immersion objective and No. 4 compensating ocular.

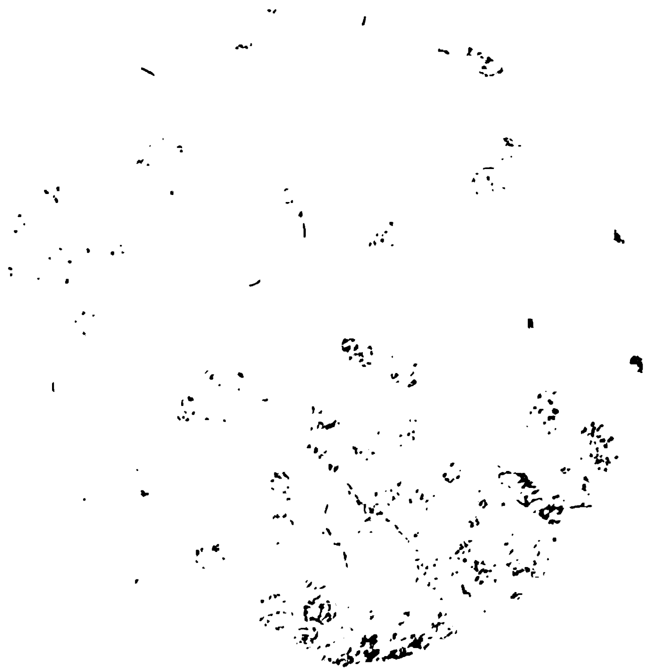

Fig. 1.

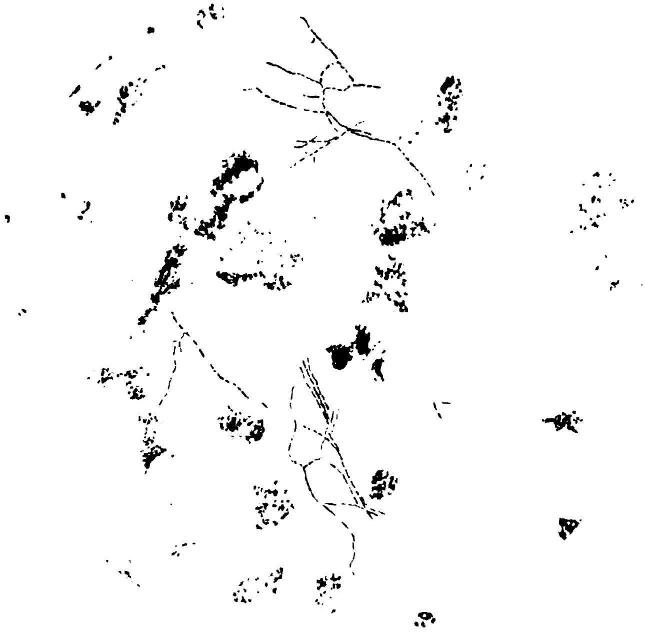

Fig. 2

F. — culosis Bacilli from Spleen of Guinea Pig, No. 28 a, Cow No. 65.

roof Bacilli from Liver of Guinea Pig, No. 1563, Cow No. 85.

Description of Plate II.

Fig. 1. Cover-glass preparation from a caseous focus in the spleen of guinea pig No. 28a, fed with milk from cow No. 65. Stained by Ziehl-Nielsen's method. Drawing made with Zeiss 2 mm. oil immersion objective and No. 4 compensating ocular.

Fig. 2. Cover-glass preparation from a caseous focus in the liver of guinea pig No. 1563, inoculated intra-abdominally with the milk sediment from cow No. 85. Stained by Ziehl-Nielsen's method. Drawing made with Zeiss 2 mm. oil immersion objective and No. 4 compensating ocular.

and cover-glass preparations were substantiated by a subseries of inoculations of an emulsion of the lesions into guinea pigs. (See table below.) This latter work was carried out for the purpose of establishing beyond peradventure that the lesions produced by the milk in these experiments were the result of the tubercle bacillus and not dependent upon the action of any of the "acid proof" bacteria. Only in the case of 3 guinea pigs inoculated with the milk of cow No. 85 (see p. 58) were the lesions caused by one of these microorganisms, Moeller's grass bacillus. (See Plate II, fig. 2.) This mycobacterium might be taken for the tubercle bacillus when the filaments become disrupted. It is also capable of producing lesions of a pseudotuberculosis in guinea pigs that would lead to confusion unless closely studied microscopically. In addition to this microorganism several others were isolated from the lesions resulting from these experiments, and in certain cases (cows Nos. 68, 79, and 105) they were directly responsible for the early fatalities noted. Among those most constantly present were staphlococci, streptococci, diplococci, sarcina, bacillus coli communis, bacillus mesentericus, pseudomonas pyocanea, bacillus subtilis, bacillus aromaticus, and several undetermined species.

Forty-three guinea pigs for use as checks in this investigation were placed in cages between the experimental animals and subjected to the same external influences as the latter. (See p. 26.) The results were entirely negative, but they support incidentally the positive evidence of the infectivity of the milk given below.

Positive results obtained by subinoculations of guinea pigs.

Guinea pig No.	Date of injection.	Source of material injected.	From cow No.	Date of death.	Postmortem diagnosis.
1075	Sept. 8	Guinea pig 12a	4	Oct. 19	Tuberculosis.
1125	Sept. 10	Guinea pig 10a	4	Sept. 23	Do.
1126	do	Guinea pig 19a	15	Oct. 2	Do.
141	Sept. 29	Guinea pig 31	64	Oct. 17	Do.
78	Aug. 22	Guinea pig 29a	65	Sept. 29	Do.
79	do	do	65	Oct. 7	Do.
143	Sept. 30	Guinea pig 43a	71	Oct. 27	Do.
91	Sept. 16	Guinea pig 46a	73	Oct. 9	Do.
1782	Sept. 20	Guinea pig 50a	74	Nov. 8	Do.
1783	do	do	74	Nov. 27	Do.
1079	Sept. 9	Guinea pig 58a	77	Sept. 30	Do.
1723	Nov. 25	Guinea pig 1682	98	Dec. 12	Do.
84	Aug. 31	Guinea pig 99a	102	Sept. 29	Do.
1944	Dec. 15	Guinea pig 1649	102	Jan. 14	Do.
1945	Dec. 18	Guinea pig 1650	102	Jan. 2	Do.
1355	Sept. 12	Guinea pig 103a	104	Oct. 11	Do.

Check guinea pigs.

Guinea pig No.	Location.	Date when killed or died.	Postmortem.
976	Adjoining cage 16[a]	Oct. 23, 1900	No lesion.
993	Adjoining cage 16	Dec. 17, 1900	Do.
1022	....do	....do	Do.
1156	Adjoining cage 72	Dec. 10, 1900	Do.
1183	Adjoining cage 77	Dec. 30, 1900	Do.
1184	Adjoining cage 74	Nov. 7, 1900	Do.
1185	....do	Oct. 31, 1900	Do.
1186	Adjoining cage 66	Dec. 17, 1900	Do.
1187	....do	Sept. 12, 1900	Septic metritis.
1188	Adjoining cage 3	Jan. 22, 1901	No lesion.
1189	Adjoining cage 79	Dec. 10, 1900	Do.
1192	Adjoining cage 68	Sept. 17, 1900	Pneumonia.
1193	....do	Jan. 8, 1901	No lesion.
1194	....do	....do	Do.
1200	Adjoining cage 19	Dec. 6, 1900	Do.
1201	....do	Dec. 28, 1900	Do.
1202	....do	....do	Do.
1203	Kept in one large cage facing the experiment animals.	Dec. 10, 1900	Do.
1204		Nov. 2, 1900	Pneumonia.
1205		Dec. 30, 1900	No lesion.
1206		Dec. 16, 1900	Do.
1210		....do	Do.
1211		....do	Do.
1212		Aug. 2, 1900	Pneumonia.
1254	Adjoining cage 5	Nov. 9, 1900	No lesion.
1260	....do	....do	Do.
1275	Adjoining cage 86	Dec. 30, 1900	Do.
1276	....do	....do	Do.
1280	Adjoining cage 76	Oct. 31, 1900	Enteritis.
1281	....do	Dec. 10, 1900	No lesion.
1305	Adjoining cage 106	Nov. 14, 1900	Do.
1309	....do	....do	Do.
1310	Adjoining cage 1	Nov. 12, 1900	Do.
1311	....do	....do	Do.
1312	Adjoining cage 95	Dec. 10, 1900	Do.
1313	Adjoining cage 78	Oct. 17, 1900	Do.
1314	....do	....do	Do.
1315	Adjoining cage 100	Jan. 22, 1901	Do.
1316	Adjoining cage 91	....do	Do.
1317	....do	Nov. 2, 1900	Do.
1318	Adjoining cage 108	Nov. 16, 1900	Do.
1319	....do	....do	Do.
1389	Adjoining cage 112	Jan. 22, 1901	Do.

[a] Number of cage corresponds to the number of the cow.

CONDENSED STATISTICS RELATING TO THE MILK EXPERIMENT.

The following tables show, in a form convenient for comparison, the history, physical examination, tuberculin reaction, and postmortem examination, together with the results of the feeding and inoculation experiments, as well as the microscopic examination of the milk and cream of each individual cow in this test.

Cow No. 1. St. Elizabeth herd.

Age, 6 years; condition, fleshy; number of calves, 4; breed, grade Ayrshire; origin, raised.

Physical examination, September 26, 1900: Pulse, 38; respiration, 22; temperature, 101.4°. Superficial lymph glands, normal. Lungs: Percussion, normal; auscultation, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a.m	101.8°	102.3°
9 a.m	100.9	102.3
12 m	101	104.3
3 p.m	101	103.6
6 p.m	101.8	103.2

Postmortem, Rosslyn, Va., December 17, 1900: Caudal node of posterior mediastinal lymph gland enlarged to size of a hen's egg, and contains caseous material. The other glands in this chain are slightly enlarged and contain a few necrotic centers from one-fourth to five-eighths of an inch in diameter. Eight or nine of the mesenteric lymph glands show a few tubercles from the size of a hemp seed to that of a pea.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
1a	July 19 to Sept. 27	80	Sept. 27	70	Not tuberculosis	
2a	July 19 to Oct. 9	80	Oct. 17	90	do	
3a	July 19 to Aug. 22	80	Aug. 22	34	do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
1	July 26	Milk and cream	1.5	Oct. 31	97	No lesions	
2	do	do	1.5	Oct. 15	81	do	
3	do	do	1	Oct. 28	94	do	

SECOND SERIES.

Cow dry.

Cow No. 2. St. Elizabeth herd.

Age, 7 years; condition, good; number of calves, 4; breed, Holstein grade; origin, raised.

Physical examination October 18, 1900: Pulse, 42; respiration, 16; temperature, 100.6°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a.m	101.9°	105.6°
9 a.m	101.8	104.8
12 m	101.6	105.6
3 p.m	101.8	104.1
6 p.m	102	102.8

Postmortem, Rosslyn, Va., December 11, 1900: One firm, caseous area about 2 inches in diameter in ventral lobe of right lung and surrounded by an inflammatory zone. Several encysted tuberculous foci in parenchyma of left caudal lobe about the size of a shellbark, which appear slightly calcareous on section.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
4a	July 9 to Oct. 9	80	Nov. 23	137	No lesions	
5a	.....do	80	Oct. 10	93	Not tuberculosis	
6a	.....do	80	Nov. 5	119	No lesions	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
4	July 26	Milk and cream	2	Oct. 11	77	No lesions	
5	....do	.....do	1.5	Nov. 13	110	.....do	
6	....do	.....do	1	Sept. 11	47	Pneumonia	

SECOND SERIES.

1397	Oct. 11	Milk	3	Nov. 3	23	Not tuberculosis	
1398	....do	.....do	5	Dec. 3	53	No lesions	
1399	....do	Cream	3	Dec. 13	63	.....do	

Cow No. 3. St. Elizabeth herd.

Age, 6 years; condition, fair; number of calves, 4; breed, Ayrshire grade; origin, raised.

Physical examination, October 18, 1900: Pulse, 39; respiration, 21; temperature, 102.1°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.8°	102°
9 a. m	101.6	102.5
12 m	102	105.1
3 p. m	102.6	105
6 p. m	102.5	104.4

Postmortem, Fowlers, D. C., May 31, 1901: Two small, caseous nodules one-half inch in diameter, in cephalic lobe of right lung and three smaller areas in ventral lobe of left lung. In the large posterior mediastinal gland there is one tuberculous focus about one-half inch in diameter, completely calcified. One mesenteric gland is involved and contains a partly calcareous nodule three-eighths inch in diameter.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
7a	July 9 to Oct. 9	80	Dec. 10	154	No lesions	
8a	.....do	80	Dec. 11	155	.....do	
9a	.....do	80	Dec. 30	174	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
7	July 27	Milk and cream.	2	Nov. 6	102	No lesions	
8	....do...	......do	2	Oct. 22	87	.....do	
9	....do...	......do	1	Oct. 15	80	.....do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1401	Oct. 12	Cream	3	Jan. 25	105	No lesions	
1402	....do...	......do	5	Jan. 29	109	.....do	
1403	....do...	Milk	5	Dec. 20	69	Pneumonia	Negative.
1404	....do...	......do	3	Nov. 10	29	Not tuberculosis	

Cow No. 4. St. Elizabeth herd.

Age, 6 years; condition, fair; number of calves, 3; breed, Ayrshire grade; origin, raised.

Physical examination October 18, 1900: Pulse, 36; respiration, 19; temperature, 100.6°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 p. m	101.8°	102.3°
9 p. m	100.2	104.6
12 m	100.8	106.2
3 p. m	101.6	106.4
6 p. m	101.4	104.6

Postmortem, March 26, 1901, at Fowlers, D. C.: Right posterior pharyngeal lymph gland contains several small tuberculous foci. Left posterior pharyngeal gland is completely degenerated, about the size of a pigeon's egg, and contains cheesy pus. The prepectoral glands are enlarged and show foci of tuberculosis. Left bronchial lymph gland is tuberculous and the posterior mediastinal glands contain five or six small caseous centers. The right principal lobe of lung contains five or six caseous areas varying in size from a pea to a hen's egg. One small focus in caudal lobe of left lung. The parietal pleura is covered with a tuberculous growth (pearl disease), forming adhesions with the right lung and extending over the thoracic surface of the diaphragm.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
10a	July 9 to Sept. 10	80	Sept. 10	63	Tuberculosis	Positive.
11a	July 9 to Sept. 26	80	Sept. 26	79	.....do	Do.
12a	July 9 to Sept. 8	80	Sept. 8	61	.....do	Do.

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
10	July 27	Milk and cream	2	Sept. 8	43	Tuberculosis	Positive.
11	...do	.....do	1.5	Nov. 6	102	No lesions	
12	...do	.....do	1	Nov. 7	103	.....do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1403	Oct. 11	Milk	5	Dec. 7	57	Not tuberculosis	
1404	...do	.....do	3	Dec. 29	79	No lesions	
1405	...do	Cream	5	Dec. 19	69	.....do	
1406	...do	.....do	3	Nov. 1	20	Pneumonia	

Cow No. 5. St. Elizabeth herd.

Age, 7 years; condition, good; number of calves, 3 or 4; breed, Holstein; origin, raised.

Physical examination, October 18, 1900: Pulse, 47; respiration, 24; temperature, 101.1°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.4°	101.7°
9 a. m	101.3	102.4
12 m	101.4	106.5
3 p. m	101.1	105.4
6 p. m	102.1	106

Postmortem, Rosslyn, Va., February 1, 1901: Small calcareous focus the size of a hazelnut in ventral lobe of right lung. Anterior mediastinal gland contains three or four encapsulated foci one-third of an inch in diameter and of a gritty consistency.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.[a]

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
13a	July 9 to July 15	80	Oct. 18	101	No lesions	
14a	.....do	80	Oct. 4	87	.....do	
15a	.....do	80	Nov. 7	121	.....do	

[a] This animal became dry shortly after feeding experiments began.

Cow No. 8. St. Elizabeth herd.

Age, 9 years; condition, good; number of calves, (?); breed, common; origin, bought three years ago.

Physical examination, September 19, 1900: Pulse, 50; respiration, 20; temperature, 101.6°. Glands: Submaxillary, normal; supramammary, normal; udder, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.6°	105°
9 a. m	101.4	105
12 m	101.2	106.2
3 p. m	101.2	106.5
6 p. m	102	103.8

Postmortem, Rosslyn, Va., December 17, 1900: Both retropharyngeal glands show several necrotic areas the size of hemp seeds. Left tonsil contains purulent nodule the size of an acorn. Few small necrotic foci in posterior mediastinal glands. One cluster the size of a hen's egg in anterior portion of principal lobe of right lung, which on section is partly calcareous. Similar lesion in apex of left lung.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
121a	July 9 to Sept. 28	80	Nov. 16	130	Normal	
122a	.....do	80	Dec. 29	173	.....do	
123a	.....do	80	Dec. 5	149	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
13	July 28	Milk and cream.	3	Sept. 8	42	Not tuberculosis	
14	....do	.....do	2	Oct. 6	70	Normal	
15	....do	.....do	2	Oct. 15	79	.....do	

SECOND SERIES.

Cow dry.

Cow No. 10. St. Elizabeth herd.

Age, 6 years; condition, excellent; number of calves, 3; breed, grade Ayrshire; origin, raised.

Physical examination, October 10, 1900: Pulse, 38; respiration, 22; temperature, 101.7°. Lymph glands: Submaxillary, normal, supramammary, normal. Lungs: No record of examination.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	102°	102.4°
9 a. m	101.5	102
12 m	102.6	104.2
3 p. m	102.6	105.8
6 p. m	102.3	103.8

Postmortem, at experiment station, Bethesda, Md., November 13, 1901:[a] Numerous foci of tuberculosis in the lymph glands at the base of the tongue. The glands are enlarged and the foci vary in size from one-eighth to 1 inch. The centers of some are softened, and a deposit of calcareous matter is present in the peripheral portions of the foci. The mediastinal glands are somewhat enlarged and contain tubercular foci in a partly broken-down condition. Scattered over the costal and pulmonary pleura are numerous tubercular excrescences which vary in size from a pea to confluent masses 4, 5, and 6 inches in diameter. Sprinkled throughout the lungs are groups of isolated and confluent tubercular nodules varying in size from one-eighth to 3 inches, some of which are in a broken-down condition and in direct communication with the bronchi. Scattered over the pericardium are tubercular growths similar to those on the pleura. On the surface of the liver, each adherent to it by means of a narrow band of tissue, are several tubercular tumors, from one-half to 2 inches in diameter. A few small tubercular foci are seen in the liver and portal glands. Surface of spleen and omentum are covered with tubercular excrescences.

Microscopic examination of centrifugal sediment of milk, positive; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
124a	July 9 to Aug. 21 ...	80	Aug. 21	43	Pyemia	Negative.
125a	July 9 to Oct. 9	80	Dec. 13	157	Pneumonia	Do.
126a	.....do	80	Oct. 10	93	No lesions	
127a	.....do	80	Nov. 5	119	.....do....................	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
16	July 28	Milk and cream.	3	Sept. 16	50	Not tuberculosis......	
17	....do ...	.....do	2	Oct. 28	92	No lesions	
18	....do ...	.....do	2	Nov. 5	100	.....do	

SECOND SERIES.

1409	Oct. 11	Cream	5	Jan. 12	93	No lesions	
1410	....do ...	.....do	3	Dec. 17	67	.....do	
1411	....do ...	Milk............	5	Dec. 30	80	.....do	
1412	....do ...	.....do	8	Nov. 27	47	Not tuberculosis......	

Cow No. 12. St. Elizabeth herd.

Age, 8 years; condition, fair; number of calves, 4; breed, grade Holstein; origin, raised.

Physical examination, January 4, 1901: Pulse, 52; respiration, 24; temperature, 102.9°. Glands: Submaxillary, normal; supramammary, normal. Lungs: Percussion, apparently normal; auscultation, right lung, increased bronchial breathing; left lung, increased bronchial breathing.

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[a] For the postmortem notes on cow No. 10 the writer is indebted to Dr. E. C. Schroeder, superintendent of experiment station, Bethesda, Md.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.9°	105.5°
9 a. m	102.8	107.4
12 m	102.6	104.9
3 p. m	102.8	104.9
6 p. m	102.8	103.7

Postmortem, Rosslyn, Va., February 5, 1901: Both lungs show miliary tuberculosis throughout the parenchyma of all the lobes. The parietal pleura on both sides contains numerous isolated and confluent grape-like masses (pearl disease). The bronchial and entire chain of mediastinal glands are enlarged and caseous. Five or six of the mesenteric glands enlarged, and contain cheesy deposits.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative

Feeding experiments

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
119a	July 9 to Oct. 9	80	Nov. 28	142	No lesions	
120a	do	80	Nov. 11	125	do	
121a	do	80	Dec. 21	165	No evidence of tuberculosis.	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
22	July 30	Milk and cream.	1.5	Oct. 24	86	Normal	
23	do	do	3	Oct. 15	77	do	
24	do	do	2	Oct. 7	69	do	

SECOND SERIES.

1420	Oct. 12	Cream	5	Dec. 26	75	No lesions	
1421	do	Milk	3	Dec. 6	55	Tuberculosis	Positive.
1422	do	do	5	Dec. 26	75	No lesions	

Cow No. 14. St. Elizabeth herd.

Age, 5 years; condition, good; number of calves, 2; breed, Ayrshire; origin, raised.

Physical examination, September 19, 1900: Pulse, 46; respiration, 17; temperature, 101°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection	May 3, 1900. After injection.
6 a. m	102°	103.1°
9 a. m	100.4	103.8
12 m	100.4	105.4
3 p. m	101.6	105.2
6 p. m	101.7	104.2

Postmortem, Rosslyn, Va., February 5, 1901: Caudal lobe of right lung contains a walnut-sized nodule, which appears calcareous on section. A few isolated excrescences are seen on the parietal pleura of each side. The entire posterior mediastinal chain of glands are enlarged, and the lymph structure is completely replaced by a calcareous deposit. Left bronchial gland is the size of a duck's egg and likewise calcified.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
16a	July 9 to Oct. 9	80	Oct. 24	107	No lesions	
17a	July 9 to Sept. 9	80	Sept. 9	62	Not tuberculosis	
18a	July 9 to Oct. 9	80	Nov. 20	134	No lesions	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
19	July 30	Milk and cream.	3	Nov. 3	96	No lesions	
20	....do	.....do	2	Nov. 12	105	.....do	

SECOND SERIES.

Cow dry.

Cow No. 15. St. Elizabeth herd.

Age, 7 years; condition, fairly good; number of calves, 4; breed, grade Holstein; origin, raised.

Physical examination, October 10, 1900: Pulse, 42; respiration, 20; temperature, 101.2°. Glands: Submaxillary, normal; supramammary, normal; udder, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101°	106.9°
9 a. m	101	105.2
12 m	101.3	106.1
3 p. m	101.5	106.9
6 p. m	103	106

Postmortem, Rosslyn, Va., December 17, 1900: Caudal lobe of left lung has a number of caseous areas from the size of a pea to that of a walnut. Posterior mediastinal glands are enlarged and contain five centers of tuberculosis of a semicalcareous nature. The bronchial and prepectoral glands are slightly enlarged and contain small yellow tubercles that are undergoing cheesy necrosis. Two tuberculous ulcers, size of quarter and dime, at bifurcation of trachea. Six or seven of the mesenteric glands show a number of small caseous foci. Liver shows a caseous tuberculous focus size of a pea.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
19a	July 9 to Sept. 10....	80	Sept. 10	63	Tuberculosis................	Positive.
20a	July 9 to Sept. 11....	80	Sept. 11	64	.....do..........................	Do.
21a	July 9 to Aug. 20....	80	Aug. 20	42	Enteritis......................	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
25	July 30	Milk and cream.	2	Sept. 25	57	Tuberculosis	Positive.
26	....do...	.....do..........	2	Nov. 18	111	Normal...............	
27	....do...	.....do..........	2	Nov. 23	116	.....do................	

SECOND SERIES.

1423	Oct. 13	Milk............	5	Dec. 22	70	Not tuberculosis......	
1424	....do...	.....do..........	3	Dec. 19	67	.....do................	
1425	Oct. 15	Cream..........	5	Jan. 5	82	Normal...............	
1426	....do...	.....do..........	3	Jan. 15	92	.....do................	

Cow No. 16. St. Elizabeth herd.

Age, 10 years; condition, unthrifty; number of calves, 6; breed, Holstein; origin, raised.

Physical examination, September 25, 1900: Pulse, 46; respiration, 18; temperature, 101.1°. Glands: Submaxillary, normal; supramammary, normal. Lungs: Percussion, normal; auscultation, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m..	101.1°	102.2°
9 a. m..	101	102
12 m..	100.8	103.5
3 p. m..	101.2	105
6 p. m..	102.1	103.5

Postmortem at experiment station, Bethesda, Md., November 23, 1901:[a] The mediastinal glands, which are enlarged, contain a few very small tubercular foci. The posterior portion of the principal lobe of the left lung solidified for a distance of 5 inches from the tip forward. Similar mass, about 4 inches in diameter, in the dorsal portion of this lung. Sprinkled throughout the lungs generally are a few tubercular foci about 1 inch in diameter. The material in these lesions is undergoing softening, and two or three pockets, containing softened tubercular material, are in direct communication with the bronchial tubes.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

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[a] For the postmortem notes on cow No. 16 the writer is indebted to Dr. E. C. Schroeder, superintendent of experiment station, Bethesda, Md.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
22a	July 9 to Aug. 14	80	Aug. 14	36	Not tubercular	
23a	July 9 to Sept. 25	80	Nov. 15	129	.....do	
24a	July 9 to Aug. 31	80	Aug. 31	53	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
29	July 30	Milk and cream.	2	Sept. 8	40	Not tubercular	
30	....do	....do	2	Nov. 5	98	No lesions apparent	

SECOND SERIES.

Cow at the experiment station when the second test was made.

Cow No. 17. St. Elizabeth herd.

Age, 8 years; condition, good; number of calves, 3; breed, common; origin, bought 4 years ago.

Physical examination, October 25, 1900: Pulse, 36; respiration, 22; temperature, 100.6°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.1°	101.7°
9 a. m	101.1	102.7
12 m	100.8	105.3
3 p. m	101	105.3
6 p. m	102.5	105.2

Postmortem, Rosslyn, Va., February 1, 1901: Five tuberculous foci in posterior mediastinal glands from one-eighth to one-fourth inch in diameter and of a caseous nature. Several tubercular areas on dorsal border of caudal lobe of right lung size of a shellbark to a hen's egg. They have undergone caseous changes and show a tendency to coalesce. Liver contains a large abscess, not tubercular.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
161a	July 30 to Oct. 9	80	Nov. 9	102	No lesions	
162a	.....do	80	Nov. 30	123	.....do	
163a	.....do	80	Nov. 14	107	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
192	Aug. 30	Milk	3	Oct. 24	55	No lesions	
193	....do	....do	2	Nov. 27	89	....do	
194	....do	Cream	3	Nov. 22	84	....do	
195	....do	....do	2	Oct. 15	46	No apparent lesions	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1472	Oct. 16	Cream	3	Jan. 5	81	No lesions	
1473	....do	Milk	4	Dec. 13	58	....do	
1474	....do	....do	2	Jan. 12	88	....do	

Cow No. 18. St. Elizabeth herd.

Age, 7 years; condition, good; number of calves, (?); breed, common; origin, bought 6 months before test.

Physical examination, October 25, 1900: Pulse, 44; respiration, 20; temperature, 101°; M. M., normal. Glands: Submaxillary, normal; supramammary, normal. Lungs: Percussion, right lung, clear, left lung, clear; auscultation, right lung, clear, left lung, clear.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.4°	102.4°
9 a. m	100.9	102.3
12 m	101	102.6
3 p. m	101.4	105.3
6 p. m	102	105.2

Postmortem, Rosslyn, Va., December 17, 1900: The posterior mediastinal glands are greatly enlarged and completely calcareous. The anterior mediastinal glands contain four necrotic foci from one-eighth to one-fourth inch in diameter. The bronchial glands are slightly increased in size and contain several caseous nodules from the size of a pea to a hazelnut.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis	Microscopic examination of lesions.
		c. c.				
137a	July 31 to Oct. 9	80	Nov. 12	104	Normal	
138a	.....do	80	Nov. 26	118	.....do	
139a	.....do	80	Dec. 14	136	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
61	Aug. 4	Milk and cream.	3	Aug. 7	3	Pyemia	
62	....do	.....do	2	Oct. 3	60	Not tuberculosis	
63	....do	.....do	2	Nov. 12	100	No lesions	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1427	Oct. 13	Milk	5	Dec. 22	70	Normal	
1428	....do	.....do	3	Dec. 17	65	.....do	
1429	Oct. 15	Cream	5	Dec. 3	49	.....do	
1430	....do	.....do	3	Dec. 15	61	Enteritis	

Cow No. 19. St. Elizabeth herd.

Age, 8 years; condition, good; number of calves, 4; breed, grade Ayrshire; origin, raised.

Physical examination, January 3, 1901: Pulse, 44; respiration, 20; temperature, 100.1°. Superficial lymph glands, normal. Lungs: Percussion apparently clear; auscultation, right lung, apparently normal; left lung, intermittent mucous râles.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	100.6°	104.5°
9 a. m	101	106.5
12 m	101.7	105.9
3 p. m	101.3	105
6 p. m	102.2	104.3

Postmortem, Rosslyn, Va., February 1, 1901: Posterior portion of left caudal lobe is entirely consolidated and broken down. The cephalic lobe of right lung is one mass of caseous tubercular material. Bronchial and both mediastinal glands enlarged and completely degenerated. Prepectoral gland contains three miliary indurated foci. Mesenteric glands show foci in five or six nodes. Omentum and peritoneum covered by grape-like clusters of tubercular neoplasms. Trachea contains fourteen small tuberculous ulcers with suppurating surfaces.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
170a	July 9 to Oct. 9	80	Dec. 9	153	No lesions	
171a	.....do	80	Dec. 17	161	.....do	
172a	July 9 to Oct. 4	80	Oct. 4	87	Not tuberculosis	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
92	Aug. 14	Milk	3	Oct. 22	69	No lesions	
93	....do...	.....do	2	Dec. 1	109	.....do	
94	....do...	Cream	3	....do...	109	.....do	
95	....do...	.....do	2	Sept. 8	25	Not tuberculosis	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1431	Oct. 13	Milk	3	Dec. 22	70	No lesions	
1432	....do...	.....do	5	....do...	70	.....do	
1433	....do...	Cream	5	Dec. 6	54	.....do	
1434	....do...	.....do	3	Dec. 17	65	.....do	

Cow No. 20. St. Elizabeth herd.

Age, 2½ years; condition, good; number of calves, 1; breed, Holstein; origin, raised.

Physical examination, October 10, 1900: Pulse, 44; respiration, 21; temperature, 102°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.3°	103.8°
9 a. m	101.4	105.5
12 m	101.5	105.7
3 p. m	102.2	105.3
6 p. m	102.2	105.1

Postmortem, Benning, D. C., March 9, 1901: The posterior mediastinal glands contain seven or eight encapsulated foci from one-fourth to five-eighths inch in diameter that show a calcareous infiltration. Left ventral lobe is transformed into a solid tuberculous mass and contains a semicalcareous material. Right lung contains a few small caseous nodules in caudal lobe. Pleural adhesions present on both sides, but no excrescences observed.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
131a	July 9 to Oct. 9	80	Jan. 2	177	No lesions	
132a	.....do	80	Dec. 21	165	.....do	
133a	.....do	80	Nov. 12	126	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
88	Aug. 14	Milk	3	Sept. 30	47	Not tuberculosis	
89	....do	....do	2	Sept. 25	42	....do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1435	Oct. 13	Milk	5	Dec. 19	67	No lesions	
1436	....do	....do	3	Nov. 6	24	Not tuberculosis	
1437	....do	Cream	5	Dec. 20	68	No lesions	

Cow No. 64. St. Elizabeth herd.

Age, 5 years; condition, good; number of calves, 2; breed, Holstein; origin, bought 1½ years ago.

Physical examination, January 4, 1901: Pulse, 54; respiration, 20; temperature, 101.7°. Superficial lymph glands, normal. Lungs: Percussion, right lung, apparently normal; left lung, dullness along posterior superior border; ausculation, right lung, clear; left lung, mucous rales appearing intermittent.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.8°	105 °
9 a. m	101	105.4
12 m	101.4	106
3 p. m	101	106.2
6 p. m	101.1	105

Postmortem, at Fowlers, D. C., April 12, 1901: The principal lobe of left lung contains a cluster of tuberculous nodules covering an area 4 inches in diameter and leading into at least two bronchi. One small encysted focus in cephalic lobe of right lung. Posterior mediastinal glands contain several small tubercular foci from one-fourth to one-half inch in diameter and of a cheesy nature. Left pharyngeal gland is size of a hen's egg and on section shows a caseous change, with center calcareous. The mucous membrane of trachea presents 6 suppurating ulcers with irregular raised borders surrounded by a hyperemic zone. Liver contains several necrotic foci the size of a pea, of tuberculous nature.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
25a	July 9 to Oct. 9	80	Nov. 9	123	No lesions	
26a	.....do	80	Dec. 12	156	.....do	
27a	.....do	80	Oct. 10	93	Not tuberculosis	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
31	July 31	Milk and cream.	3	Sept. 29	60	Tuberculosis	Positive.
32	....do	....do	2	Oct. 27	88	No lesions	
33	....do	....do	2	Nov. 17	109	....do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1476	Oct. 15	Milk	4	Dec. 18	64	No lesions	
1477	....do	....do	3	Nov. 15	31	Tuberculosis	Positive.
1478	....do	Cream	3	Dec. 15	61	No lesions	
1479	....do	....do	5	Nov. 24	40	Tuberculosis	Do.

Cow No. 65. St. Elizabeth herd.

Age, 8 years; condition, unthrifty; number of calves, 3; breed, Holstein; origin, bought in Virginia one year ago.

Physical examination, September 11, 1900: Pulse, 57; respiration, 36; temperature, 102.9°. Glands: Right submaxillary, enlarged; supramammary, normal. Lungs: Percussion, right lung, dullness right posterior border; left lung, normal; auscultation right lung, mucous râles, with areas of silence; left lung, mucous râles.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.2°	102.2°
9 a. m	101.9	103.6
12 m	100.5	105.8
3 p. m	102	104.3
6 p. m	102.2	103.3

Postmortem, Rosslyn, Va., December 11, 1900: All the lobes of both lungs show advanced tuberculosis, several abscesses being in direct communication with the bronchi in the right caudal lobe. The bronchial glands are the size of a hen's egg and entirely caseated. The anterior and posterior mediastinal glands are greatly enlarged, the caudal node being the size of one's fist, the others in proportion, and all being calcareous on section. The right submaxillary, the prepectoral, the lumbar, the left deep inguinal, the portal, and almost the entire chain of mesenteric glands show more or less degenerated tuberculous foci. The pleura and peritoneum are covered with tubercular neoplasms (pearl disease), which are also found on the pericardium and on the serous covering of the bladder, liver, spleen, and stomach. The liver contains a semicalcareous area the size of a hen's egg. The left kidney shows three encysted tuberculous foci, one-third to three-fourths inch in diameter and of a caseous nature.

Microscopic examination of centrifugal sediment of milk, positive; of cream, positive.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
28a	July 9 to Aug. 29 ...	80	Aug. 29	51	Tuberculosis	Positive.
29a	July 9 to Aug. 22 ...	80	Aug. 22	44	.....do.....................	Do.
30a	July 9 to Oct. 9	80	Oct. 30	113	.....do.....................	Do.

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
34	July 31	Milk and cream.	3	Aug. 12	12	Pneumonia...........	Negative.
35	....do...	.....do..........	2	Aug. 8	8	Subacute peritonitis..	

SECOND SERIES.

1480	Oct. 16	Cream	5	Dec. 23	68	No lesions	
1481	....do...	.....do..........	3	Nov. 10	25	Tuberculosis	Positive.
1482	....do...	Milk............	5	Nov. 28	43	.....do................	Do.
1483	....do...	.....do..........	3	Dec. 28	73	No lesions	

Cow No. 66. St. Elizabeth herd.

Age, 7 years; condition, poor; number of calves, 3; breed, Holstein; origin, raised.

Physical examination, October 10, 1900: Pulse, 40; respiration, 20; temperature, 101.9° Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	102°	102.6°
9 a. m	101.1	104.2
12 m	100.1	106.5
3 p. m	100.9	107.2
6 p. m	101.2	106.6

Postmortem, Rosslyn, Va., December 11, 1900: Small tuberculous focus one-half inch in diameter in apex of cephalic lobe of right lung. Over the pleural surface of left lung are numerous isolated and confluent grape-like excrescences, while the parietal pleura shows a few scattered clusters. Both bronchial, anterior and posterior mediastinal, and the prepectoral glands all show miliary foci of tuberculosis.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
31a	July 9 to Oct. 9	120	Nov. 8	122	No lesions..................	
32a	.....do	120	Nov. 17	131	.....do.....................	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
37	July 31	Milk and cream	3	Nov. 30	122	No lesions	
38	....do...	.....do	2	Nov. 26	118	.....do	
39	....do...	.....do	2	Oct. 4	65	.....do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1470	Oct. 16	Cream	3	Jan. 4	80	No lesions	
1471	....do...	Milk	5	Nov. 19	34	Not tuberculosis	
1485	....do...	.....do	3	Jan. 25	101	No lesions	
1486	....do...	Cream	5	Jan. 12	88	.....do	

Cow No. 67. St. Elizabeth herd.

Age, 4 years; condition, good; number of calves, 2; breed, Holstein; origin, raised.

Physical examination, September 11, 1900: Pulse, 52; respiration, 26; temperature, 101.5°. Superficial lymph glands, normal. Lungs, apparently normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	100.4°	106.7°
9 a. m	101.2	105.6
12 m	101.2	106.2
3 p. m	101.8	106.1
6 p. m	102.2	105.1

Postmortem, Benning, D. C., March 8, 1901: In posterior portion of both principal lobes are several caseous nodules from one-half to 1½ inches in diameter. The ventral lobe of right lung contains four tuberculous areas that are partly broken down. Posterior mediastinal glands enlarged and contain six small calcareous foci varying in size from a hemp seed to that of a pea.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
33a	July 9 to Oct. 9	80	Jan. 1	176	No lesions	
34a	.....do	80	Nov. 24	138	.....do	
35a	.....do	80	Nov. 13	127	.....do	

Inoculation experiments.

FIRST SERIES

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
40	July 31	Milk and cream.	3	Oct. 5	66	No lesions	
41	....do	.....do	2	Oct. 1	62	.....do	
42	....do	.....do	2	Oct. 27	88	.....do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1467	Oct. 15	Milk	3	Nov. 15	31	No evidence of tuberculosis.	
1468	....do	Cream	3	Oct. 31	16	.....do	
1469	....do	.....do	5	Nov. 20	36	.....do	

Cow No. 68. St. Elizabeth herd.

Age, 8 years; condition, good; number of calves, 3; breed, Jersey; origin, bought 4 years ago.

Physical examination, October 25, 1900: Pulse, 44; respiration, 22; temperature, 101.3°. Glands: Left submaxillary, the size of a walnut; supramammary, normal. Lungs: Percussion, normal; auscultation, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.4°	106.6°
9 a. m	100.9	104.1
12 m	101	104
3 p. m	101.2	102.4
6 p. m	102	102

Postmortem, Rosslyn, Va., December 11, 1900: Caudal lobe of left lung contains, on its dorsal border, one tubercle the size of a horse-chestnut. On section it is seen to have undergone caseous necrosis. The cephalic lobe of this lung has two pea-size nodules that are likewise cheesy in consistence. The right principal lobe shows two degenerated foci the size of chestnuts located near the apex and on section are found to be of a caseo-calcareous nature. Left submaxillary gland is slightly enlarged and on section shows 4 soft, yellowish tubercles. The caudal node of the posterior mediastinal glands is the size of a hen's egg and transformed into yellow cheesy detritus.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
36a	July 9 to Oct. 9	80	Nov. 23	137	Not tuberculosis	
37a	.....do	80	Nov. 15	129	.....do	
38a	.....do	80	Nov. 18	132	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Portmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
43	Aug. 1	Milk and cream.	3	Dec. 21	142	No lesions	
44	....do	.....do	2	Sept. 28	58	Not tuberculosis	
45	....do	.....do	2	Dec. 3	124	No lesions	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Portmortem diagnosis.	Microscopic examination of lesions.
1461	Oct. 18	Milk	3	Nov. 5	18	Not tuberculosis	
1463	....do	Cream	3	Dec. 13	56	No lesions	
1464	....do	.....do	5	Nov. 17	30	Not tuberculosis	
1465	....do	Milk	5	Nov. 2	15	Hepatic abscess	Negative.

Cow No. 70. St. Elizabeth herd.

Age, 6 years; condition, good; number of calves, 3; breed, Holstein; origin, raised.

Physical examination, September 11, 1900: Pulse, 44; respiration, 23; temperature, 103.1°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	102.4°	102.6°
9 a. m	102	102
12 m	102.1	102
3 p. m	102.1	102.8
6 p. m	101.9	104.3
9 p. m		103.9

Postmortem, Fowlers, D. C., May 11, 1901: Ventral lobe of right lung shows three or four encapsuled tuberculous nodules from one-half to three-fourths inch in diameter. One small caseous focus in the caudal node of the posterior mediastinal gland. One mesenteric gland contains a necrotic focus of tuberculous origin one-eighth inch in diameter.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
39a	July 9 to Oct. 9	80	Oct. 9	91	Not tuberculosis	
40a	.....do	80	Nov. 21	135	.....do	
41a	.....do	80	Nov. 12	126	.....do	

Inoculation experiments

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
46	Aug. 1	Milk and cream	3	Nov. 25	116	No lesions	
47	....do	.....do	2	Oct. 14	74	.....do	
48	....do	.....do	3	Nov. 14	105	.....do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1487	Oct. 18	Milk	5	Nov. 9	22	Not tuberculosis	
1488	....do	.....do	3	Nov. 22	35	.....do	
1489	....do	Cream	5	Jan. 10	84	No lesions	
1490	....do	.....do	3	Jan. 13	87	.....do	

Cow No. 71. St. Elizabeth herd.

Age, 8 years; condition, fair; number of calves, 4; breed, grade Ayrshire; origin, raised.

Physical examination, November 27, 1900: Pulse, 45; respiration, 21; temperature, 102.1. Superficial lymph glands, normal. Lungs: Percussion, right lung, normal; left lung, posterior lobe gives a muffled sound; auscultation, right lung, apparently normal; left lung, mucous râles.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a.m	101.9°	102.4°
9 a.m	100.2	103.1
12 m	101.3	106.1
3 p.m	101.9	107.4
6 p.m	102.4	106.3

Postmortem, Rosslyn, Va., December 11, 1900: Right principal lobe contains many caseous foci that have not coalesced, varying in size from a pea to a shellbark. Left lung contains pus cavities in the center of principal lobe. Cephalic lobe has three caseo-calcareous areas the size of walnuts. Trachea contains five or six tuberculous ulcers on mucous membrane from three-eighths to three-fourths inch in diameter. Anterior mediastinal glands normal in size, but contain several small yellow caseous tubercles. Posterior mediastinal, left retropharyngeal, and one mesenteric gland are enlarged, and on section show cheesy degeneration.

Microscopical examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
42a	July 9 to Aug. 12	80	Aug. 12	34	Pneumonia	Negative.
43a	July 9 to Sept. 30	80	Sept. 30	83	Tuberculosis	Positive.
44a	July 9 to Sept. 20	80	Sept. 20	73	.....do	Do.

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
49	Aug. 2	Milk and cream.	3	Aug. 5	3	Peritonitis............	
50	....do...	.....do..........	3	Oct. 27	86	No lesions............	
51	....do...	.....do..........	3	Nov. 5	95	.....do...............	

SECOND SERIES.

1491	Oct. 18	Milk............	5	Dec. 22	65	No lesions............	
1492	....do...	Cream..........	5	Nov. 23	36	Tuberculosis	Positive.
1493	....do...	Milk............	3	Dec. 15	58	No lesions............	
1494	....do...	Cream..........	3	Dec. 14	57	Tuberculosis	Do.

Cow No. 72. St. Elizabeth herd.

Age, 7 years; condition, good; number of calves, 3; breed, Holstein; origin, bought two years ago.

Physical examination, September 11, 1900: Pulse, 50; respiration, 20; temperature, 102.3°. Submaxillary glands, enlarged and indurated; supramammary glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	100.1°	103°
9 a. m	100.8	106.4
12 m.	101	107
3 p. m	102	106
6 p. m	101.8	103.8

Postmortem: Animal died suddenly October 23, 1900, at the asylum, and was buried without a postmortem examination being made.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
113a	July 9 to Oct. 9.....	80	Jan. 2	177	No lesions..................	
114a	.....do.............	80	Dec. 10	154	.....do......................	
115a	.....do.............	80	Aug. 15	37	Enteritis....................	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
52	Aug. 2	Milk and cream.	3	Nov. 5	95	No lesions............	
53	....do...	.....do..........	3	Nov. 2	92	.....do...............	

Inoculation experiments—Continued.

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
1495	Oct. 18	Cream	5	Dec. 17	60	No lesions	
1496	....do	.....do	3	Nov. 13	26	Not tuberculosis	
1497	....do	Milk	5	Dec. 21	64	No lesions	
1498	....do	.....do	3	Dec. 19	62	.....do	

Cow No. 73. St. Elizabeth herd.

Age, 4 years; condition, good; number of calves, 2; breed, Holstein; origin, raised.

Physical examination, October 10, 1900: Pulse, 45; respiration, 23; temperature, 103.1°. Narrow chest. Submaxillary gland, enlarged; supramammary gland, normal. Lungs: Percussion, normal; auscultation, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	100.6°	102.2°
9 a. m	101.2	102
12 m	101.3	103.8
3 p. m	102.9	104.2
6 p. m	102.3	104.2

Postmortem, Rosslyn, Va., December 11, 1900: Right principal lobe of lung has area size of an egg containing caseous and semifluid material and a number of smaller foci with similar contents. Apex of left lung completely solidified with cheesy tuberculous mass. Anterior and posterior mediastinal, bronchial, right submaxillary, and right and left retro-pharyngeal glands all show small necrotic foci from one-fourth to three-fourths inch in diameter. Five mesenteric glands contain nodules of caseous material. Left kidney shows retention cysts.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
45a	July 9 to Oct. 7	80	Oct. 7	90	Tuberculosis	Positive.
46a	July 9 to Sept. 15	80	Sept. 15	68	.....do	do
47a	July 9 to Oct. 9	80	Dec. 20	164	No lesions	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
54	Aug. 3	Milk and cream	3	Nov. 20	109	No lesions	
55	....do	.....do	3	Sept. 4	32	Not tubercular	
56	....do	.....do	2	Sept. 11	39	.....do	
57	....do	.....do	2	Sept. 25	53	.....do	

Inoculation experiments—Continued.

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
1499	Oct. 18	Milk	5	Nov. 19	32	Tuberculosis	Positive.
1500	....do...	Cream	5	Dec. 15	58	No lesions	
1501	....do...	Milk	3	Dec. 14	57	.....do	
1502	....do...	Cream	3	Nov. 15	28	Pneumonia	Negative.

Cow No. 74. St. Elizabeth herd.

Age, 4 years; condition, fairly good; number of calves, 1; breed, grade Holstein; origin, raised.

Physical examination, September 11, 1900: Pulse, 46; respiration, 22; temperature, 102.3°. Glands: Submaxillary, normal; supramammary, normal. Lungs: Percussion, normal; auscultation, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a.m	103.2°	108°
9 a.m	103.1	105
12 m	103.1	106.2
3 p.m	103	104.4
6 p.m	102.6	105.1

Postmortem, experiment station, Bethesda, Md., November 23, 1901:[a] Lungs: Posterior half of both principal lobes affected with tuberculosis. These lobes contain numerous cavities in communication with the bronchi. The right lobe contains one very large pocket, 4 by 6 inches in area. The cavities all contain more or less broken-down, pus-like, tubercular material. A similar but smaller cavity 1 inch in diameter in left cephalic lobe. Mediastinal glands enlarged and tubercular. Glands at base of tongue greatly enlarged and converted into tubercular material, which is very much softened. Liver: Sprinkled on surface and scattered through the parenchyma are tubercular nodules, verying in size from a pea to several inches in diameter. In some places the nodules have become confluent, forming tubercular masses 5 to 6 inches in diameter. Portal glands greatly enlarged, entirely tubercular and undergoing softening. The tubercular material in the liver varies from firm nodules to soft material which, on incision, flows like semifluid pus. Mesenteric glands show occasional tubercular lesions.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
49a	July 9 to Aug 17	80	Aug. 17	39	No apparent lesions	
50a	July 9 to Sept. 20	80	Sept. 20	73	Tuberculosis	Positive.
51a	July 9 to Oct. 9	80	Dec. 17	161	No lesions	

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[a] For the postmortem notes on cow No. 74, the writer is indebted to Dr. E. C. Schroeder, superintendent of experiment station, Bethesda, Md.

Inoculation experiment.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
58	Aug. 3	Milk and cream.	3	Nov. 19	108	No lesions	
59	....do	.....do	2	....do	108	.....do	
60	....do	.....do	2	Sept. 6	34	Pneumonia	Negative.

SECOND SERIES.

Cow at the experiment station when the second test was made.

Cow No. 75. St. Elizabeth herd.

Age, 14 years; condition, rather poor; number of calves, 8; breed, grade Ayrshire; origin, raised.

Physical examination, October 18, 1900: Pulse, 32; respiration, 20; temperature, 101.6°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	102.6°	105°
9 a. m	102.4	104.8
12 m	102.9	105.2
3 p. m	102.3	102.7
6 p. m	102.4	102.4

Postmortem, Rosslyn, Va., February 5, 1901: Anterior mediastinal gland contains few tuberculous nodules. Right bronchial gland greatly enlarged, and on sectioning the contents are seen to be gritty. Posterior border of both caudal lobes of lungs contain several caseous foci size of beans. One caseous nodule in a mesenteric gland.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
51a	July 9 to Aug. 19	80	Aug. 19	41	Not tuberculosis	
52a	July 9 to Oct. 9	80	Dec. 2	146	No lesions	
53a	July 9 to Aug. 7	80	Aug. 7	29	Not tuberculosis	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
64	Aug. 6	Milk and cream.	3	Sept. 3	28	Abscess at seat of inoculation.	Negative.
65	....do	.....do	2	Oct. 12	67	No lesions	
66	....do	.....do	2	Oct. 22	77	.....do	

Inoculation experiments—Continued.

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
1503	Oct. 18	Cream	3	Jan. 11	85	No lesions	
1504	....do	Milk	3	Dec. 11	54	....do	
1505	....do	Cream	5	Nov. 25	38	Pneumonia	

Cow No. 76. St. Elizabeth herd.

Age, 4 years; condition, good; number of calves, 1; breed, Holstein; origin, raised.

Physical examination, October 18, 1900: Pulse, 32; respiration, 12; temperature, 101.5°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.2°	103.6°
9 a. m	101.6	102.4
12 m	101.6	104
3 p. m	101.5	105.6
6 p. m	102.4	103.6

Postmortem, Benning, D. C., March 8, 1901: Five small calcareous nodules in posterior mediastinal glands. Posterior pharyngeal glands are enlarged and show three or four calcareous foci in each, about one-fourth inch in diameter.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
54a	July 9 to Oct. 9	80	Oct. 28	111	Not tuberculosis	
55a	.....do	80	Oct. 18	101	.....do	
56a	July 9 to Sept. 16	80	Sept. 16	69	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection	Material.	Dose injected.	Date when killed or died	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
67	Aug. 7	Milk and cream.	3	Sept. 12	36	Not tuberculosis	
68	....do	.....do	2	Sept. 21	45	.....do	
69	....do	.....do	2	Aug. 23	16	.....do	

SECOND SERIES.

1507	Oct. 18	Cream	5	Dec. 17	60	No lesions	
1508	....do	Milk	5	Nov. 8	21	Abscess at point of injection, with pyemia.	Negative.

Cow No. 77. St. Elizabeth herd.

Age, 7 years; condition, fair; number of calves, 4; breed, Jersey; origin, raised.

Physical examination, February 4, 1901: Pulse, 46; respiration, 22; temperature, 101.1°. Superficial lymph glands, normal. Lungs: Percussion, right lung, dullness; left lung, normal; auscultation, right lung, mucous râles; left lung, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	100.5°	102.4°
9 a. m	101	105.3
12 m	101	106
3 p. m	100.8	106
6 p. m	101.4	105.3

Postmortem, Fowlers, D. C., June 4, 1901: The posterior pharyngeal, the bronchial, and the anterior and posterior mediastinal glands are all enlarged and degenerated with caseous contents. The caudal and ventral lobes of left lung show five or six nodules from the size of a shellbark to a walnut that contain partly broken-down material. In the posterior portion of right caudal lobe several tubercular foci have coalesced, forming one large irregular tuberculous mass which appears to be separated from the normal lung tissue by a retaining band of fibrous tissue. The prepectoral glands are enlarged and edematous, but do not show any foci. The parietal pleura, the anterior surface of the diaphragm, portions of the peritoneum, and posterior surface of the liver are studded with numerous tubercles of varying size, forming the so-called "pearl disease." Five or six mesenteric glands show caseous nodules from one-sixteenth to one-fourth inch in diameter.

Microscopic examination of centrifugal sediment of milk, positive; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
57a	July 9 to Sept. 12	120	Sept. 12	65	Tuberculosis	Positive.
58a	July 9 to Sept. 8	120	Sept. 8	61	do	Do.

Inoculation experiments.

FIRST SERIES

Guinea pig No.	Date of injection	Material.	Dose injected.	Date when killed or died	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
70	Aug. 8	Cream	3	Aug. 12	4	Pneumonia	
71	do	do	2	Nov. 16	100	No lesions	
72	do	Milk	2	Oct. 3	56	Tuberculosis	Positive.

SECOND SERIES.

Cow dry.

Cow No. 78. St. Elizabeth herd.

Age, 9 years; condition, good; number of calves, 4 or 5; breed, common; origin, bought five years ago.

Physical examination, September 26, 1900: Pulse, 38; respiration, 18; temperature, 101.2°. Superficial lymph glands, normal. Lungs: Examination unsatisfactory, owing to nervous temperament of animal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.5°	102°
9 a. m	101.6	101.3
12 m	101.4	103.4
3 p. m	101	104.3
6 p. m	101.8	103.3

Postmortem, Rosslyn, Va., December 17, 1900: Generalized miliary tuberculosis invades all the lobes of the lungs. Prepectoral and suprasternal glands are slightly enlarged and contain caseous foci from one-eighth to three-eighths inch in diameter. Peritoneum and spleen covered with tubercular excrescences of a nature indicative of recent infection. Six or seven glands in mesenteric chain are affected, several showing calcareous deposits.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
60a	July 9 to Sept. 12	80	Sept. 12	65	Not tuberculosis	
61a	July 9 to Oct. 9	80	Nov. 25	139	No lesions	
62a	July 9 to Sept. 24	80	Sept. 24	77	Not tuberculosis	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
73	Aug. 9	Milk	3	Nov. 17	100	Normal	
75	....do	......do	2	Sept. 16	38	Not tuberculosis	
78	....do	Cream	3	Sept. 7	29	Abscess at point of inoculation.	Negative.

SECOND SERIES.

Cow dry.

Cow No. 79. St. Elizabeth herd.

Age, 6 years; condition, poor; number of calves, (?); breed, Jersey; origin, bought three years ago.

Physical examination, October 18, 1900: Pulse, 42; respiration, 16; temperature, 102.4°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.6°	101.7°
9 a. m	102.3	103
12 m	101.4	105.3
3 p. m	101.2	105.7
6 p. m	101.2	102.9

Postmortem, Rosslyn, Va., February 5, 1901: Posterior mediastinal glands show two small foci of a semicalcareous nature. Lower border of ventral lobe of right lung contains a tuberculous area the size of a walnut. Left lung has a small tuberculous focus of putty-like consistency in ventral lobe size of a bean.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
63a	July 9 to Aug. 29	80	Aug. 29	51	Not tuberculosis	
64a	July 9 to Aug. 21	80	Aug. 21	43	do	
65a	July 9 to Aug. 10	80	Aug. 10	32	do	
66a	July 9 to Aug. 19	80	Aug. 19	41	do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
76	Aug. 10	Milk and cream	3	Sept. 14	35	Not tuberculosis	
77	do	do	2	Sept. 21	42	do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1519	Oct. 18	Cream	3	Nov. 16	29	Not tuberculosis	
1520	do	Milk	3	Dec. 6	49	No lesions	
1521	do	do	5	Dec. 19	62	do	
1522	do	Cream	5	Oct. 31	18	Hepatic abscess	

Cow No. 80. St. Elizabeth herd.

Age, 9 years; condition, poor; number of calves, 4; breed, Holstein; origin, bought three years ago.

Physical examination, September 11, 1900: Pulse, 54; respiration, 18; temperature, 101.9°. Glands: Left submaxillary, enlarged; supramammary, normal. Tumor size of a goose egg on right flank above mammary gland. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.6°	102.2°
9 a. m	101.4	101.3
12 m	101.2	104.6
3 p. m	102	105.7
6 p. m	102.4	105

Postmortem, Rosslyn, Va., December 21, 1900: Two tuberculous nodules in apex of left lung size of shellbarks. The same number of slightly larger areas are present in the principal lobe of left lung. Left submaxillary, left bronchial and posterior mediastinal glands show miliary foci undergoing necrotic changes.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Portmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
67a	July 9 to Oct. 9	80	Dec. 1	145	No lesions	
68a	do	80	Dec. 21	165	do	
69a	do	80	Oct. 10	93	Pneumonia	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
80	Aug. 11.	Cream	3	Sept. 7	27	Not tuberculosis	
81	do	do	2	Oct. 29	79	No lesions	
82	do	Milk	3	Sept. 5	23	Not tuberculosis	
83	do	do	2	Sept. 8	28	do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1549	Oct. 18	Milk	5	Dec. 15	58	No lesions	
1550	do	Cream	5	Dec. 18	61	do	
1551	do	Milk	3	Dec. 15	58	do	
1552	do	Cream	3	Nov. 12	25	Not tuberculosis	

Cow No. 81. St. Elizabeth herd.

Age, 6 years; condition, good; number of calves, (?); breed, common; origin, bought 6 months before test.

Physical examination, September 10, 1900: Pulse, 38; respiration, 22; temperature, 101.8°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	102.9°	106.4°
9 a. m	102.3	106
12 m	102	105.8
3 p. m	102.8	105.2
6 p. m	103	104.5

Postmortem, Rosslyn, Va., February 5, 1901: Left posterior pharyngeal gland size of a hen's egg, and appears as a yellowish calcareous mass. Two hemp-seed foci in right bronchial gland. Caudal node of posterior mediastinal gland, small necrotic focus. One caseous nodule the size of a walnut in apex of right lung. Both lungs are adherent to the diaphragm by hypertrophied connective tissue.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
70a	July 9 to Oct. 9	80	Dec. 13	157	Not tuberculosis	
71a	....do	80	....do	157	Normal	
72a	....do	80	....do	157	....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
84	Aug. 12	Cream	3	Nov. 20	100	Normal	
85	....do	....do	2	Oct. 27	76	....do	
86	....do	Milk	3	....do	76	....do	
87	....do	....do	3	Nov. 20	100	....do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1555	Oct. 20	Cream	5	Oct. 26	6	Peritonitis	
1556	....do	....do	3	Dec. 14	55	Normal	
1557	....do	Milk	3	....do	55	....do	
1558	....do	....do	5	Dec. 31	72	....do	

Cow No. 83. St. Elizabeth herd.

Age, 12 years; condition, good; number of calves, 8; breed, Ayrshire; origin, raised.

Physical examination, October 18, 1900: Pulse, 46; respiration, 18; temperature, 101.2°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.4°	103.6°
9 a. m	101.6	104.8
12 m	101.8	105.6
3 p. m	102.2	104
6 p. m	102.6	103.2

Postmortem, Benning, D. C., March 19, 1901: Caudal lobe of right lung shows three nodules the size of hazel nuts with caseous contents. In the cephalic lobe of left lung several tuberculous nodules have coalesced, and with the exception of the extreme apex this entire lobe is affected. Small calcified nodules size of hemp seed in one of the mesenteric glands.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
134a	July 9 to Oct. 9	80	Dec. 13	157	No lesions	
135a	.....do	80	Dec. 27	171	.....do	
136a	.....do	80	Dec. 26	170	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
196	Aug. 30	Milk	3	Sept. 22	23	Not tuberculosis	
197	....do	.....do	2	Nov. 22	84	No lesions	
198	....do	Cream	3	Nov. 19	81	.....do	
199	....do	.....do	2	Sept. 11	12	Pneumonia	

SECOND SERIES.

1559	Oct. 19	Milk	5	Dec. 4	46	Not tuberculosis	
1560	....do	.....do	3	Dec. 15	57	No lesions	
1561	....do	Cream	5	Dec. 21	63	.....do	
1562	....do	.....do	3	Dec. 17	59	.....do	

Cow No. 85. St. Elizabeth herd.

Age, 6 years; condition, good; number of calves, (?); breed, common; origin, bought six months before test.

Physical examination, October 18, 1900: Pulse, 30; respiration, 17; temperature, 101.5°. Superficial lymph glands, normal. Lungs: Percussion, normal; auscultation, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.8°	102.2°
9 a. m	102.1	102.3
12 m	101.3	104
3 p. m	101.6	103.4
6 p. m	101.7	104.3

Postmortem, at experiment station, November 13, 1901:[a] Mediastinal glands greatly enlarged and filled with areas of broken-down tubercular material. Lungs: One small focus of tuberculosis in the middle of the right principal lobe, about one-fourth inch in diameter.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

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[a] For the postmortem notes on cow No. 85 the writer is indebted to Dr. E. C. Schroeder, superintendent of experiment station, Bethesda, Md.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
140a	July 9 to Aug. 30	80	Aug. 30	52	Hepatic abscess	Negative.
141a	July 9 to Oct. 9	80	Oct. 10	93	Not tubercular	
142a	do	80	Oct. 25	108	do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
184	Aug. 29	Milk	3	Sept. 3	5	Peritonitis	Negative.
185	do	do	2	Sept. 6	8	Pyemia	Do.
186	do	Cream	3	do	8	do	Do.
187	do	do	2	Sept. 1	3	Peritonitis	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1563	Oct. 19	Milk	5	Oct. 30	11	Pseudo-tuberculosis	Acid proof bacillus.
1568	do	do	3	Nov. 6	18	do	Do.
1565	Oct. 20	Cream	5	Dec. 22	63	No lesions	
1566	do	do	3	Nov. 16	27	Pseudo-tuberculosis	Do.

Cow No. 86. St. Elizabeth herd.

Age, 7 years; condition, fairly good; number of calves, (?): Aborted 8-months' calf, June 3, 1900. Breed, common; origin, bought in Virginia six months before test.

Physical examination, October 18, 1900: Pulse, 38; respiration, 20; temperature, 101°. Superficial lymph glands, normal. Lungs: Percussion, normal; auscultation, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.5°	101.6°
9 a. m	101.2	101.2
12 m	101	103.8
3 p. m	101.2	104.3
6 p. m	101	103

Postmortem, Rosslyn, Va., February 8, 1901: Posterior mediastinal glands contain several small foci of caseous material the size of a pea. The bronchial glands are enlarged to the size of a hen's egg and contain a caseous mass, with slight tendency to calcification in the center.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
143a	July 9 to Oct. 9	80	Nov. 2	116	No lesions	
144a	July 9 to Aug. 18	80	Aug. 18	40	Not tubercular	
145a	July 9 to Sept. 14	80	Sept. 14	67	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
188	Aug. 29	Milk	3	Oct. 31	63	No lesions	
189	....do	.....do	2	Aug. 31	2	Septicemia	
190	....do	Cream	3	Nov. 20	83	No lesions	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1564	Oct. 19	Milk	3	Nov. 16	28	Not tubercular	
1567	....do	.....do	5	Dec. 21	63	No lesions	
1568	....do	Cream	3	Jan. 9	82	.....do	
1569	....do	....do	5	Jan. 11	84	.....do	

Cow No. 87. St. Elizabeth herd.

Age, 4 years; condition, fair; number of calves, 2; breed, grade Holstein; origin, raised.

Physical examination, October 25, 1900: Pulse, 38; respiration, 18; temperature, 100.6°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m.	100.1°	103.3°
9 a. m.	100.8	106.3
12 m	101	106
3 p. m.	101	105.9
6 p. m.	101.7	104.9

Postmortem, Benning, D. C., March 19, 1901: The right posterior pharyngeal gland is of normal size, but contains three miliary foci with contents of a gritty nature. The posterior mediastinal glands show three or four foci one-third to one-half inch in diameter, firmly encapsulated and completely calcified.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
146a	July 9 to Oct. 9	80	Jan. 3	178	Normal	
147a	.....do	80	Dec. 11	155	.....do	
148a	.....do	80	....do	155	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
176	Aug. 28	Milk	3	Oct. 31	64	Normal	
177	....do	.....do	2	Nov. 3	68	.....do	
178	....do	Cream	3	Nov. 4	69	.....do	
179	....do	.....do	2	....do	69	.....do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1571	Oct. 19	Milk	3	Dec. 21	63	Normal	
1572	....do	.....do	5	Dec. 17	59	.....do	
1573	Oct. 20	Cream	5	....do	58	.....do	
1574	....do	.....do	3	Jan. 14	86	.....do	

Cow No. 88. St. Elizabeth herd.

Age, 5 years; condition, fair; number of calves, 2; breed, Jersey grade; origin, bought six months before test in Virginia.

Physical examination, October 25, 1900: Pulse, 50; respiration, 24; temperature, 101.7°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.2°	102.2°
9 a. m	101.8	105.9
12 m	100.8	106.2
3 p. m	101	106.3
6 p. m	101.8	105.8

Postmortem, Asylum, November 25, 1900: Aborted November 23; death due to puerperal septicemia. Caseous focus size of an acorn in ventral lobe of right lung. The same lobe of left lung shows several foci of a caseo-calcareous consistency. Anterior and posterior mediastinal glands show recent infection of miliary tuberculosis. Posterior pharyngeal glands similarly affected. Liver shows many angiomata. Uterus contains decomposed placenta and muco-sanguinolent fluid. Spleen pulp soft and tarry.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
149a	July 9 to Oct. 9	120	Dec. 1	145	No lesions	
151a	.....do	120	Dec. 24	168	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
180	Aug. 28	Milk	3	Oct. 31	65	No lesions	
181	....do	.....do	2	Nov. 5	70	.....do	
182	....do	Cream	3	Nov. 4	69	.....do	
183	....do	.....do	2	Nov. 5	70	.....do	

SECOND SERIES.

Cow dry.

Cow No. 89. St. Elizabeth herd.

Age, 5 years; condition, good; number of calves, 2; breed, grade Holstein; origin, raised.

Physical examination, October 18, 1900: Pulse, 44; respiration, 22; temperature, 101.9°. Glands: Submaxillaries, large as walnuts and indurated; supramammary, normal. Lungs: Percussion, apparently normal; auscultation, apparently normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.7°	103.2°
9 a. m	101.2	105
12 m	100.2	105.8
3 p. m	101.4	105.8
6 p. m	102.1	105.7

Postmortem, Rosslyn, Va., February 5, 1901: The caudal lobe of left lung contains a large irregular mass of tuberculous material 4 by 6 inches which is completely broken down. Both submaxillary glands and the bronchial glands are greatly enlarged and filled with caseous material. The posterior mediastinal glands are enlarged, the caudal node being the size of an apple, and the entire chain is caseous.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
152a	July 9 to Oct. 9	80	Dec. 14	158	No lesions	
153a	.....do	80	Dec. 18	162	.....do	
154a	.....do	80	Dec. 21	165	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
124	Aug. 19	Milk	3	Nov. 16	89	No lesions	
125	....do	.....do	2	....do	89	.....do	
126	....do	Cream	3	Nov. 9	82	.....do	
127	....do	.....do	2	....do	82	.....do	

Inoculation experiments—Continued.

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
1577	Oct. 22	Cream	5	Nov. 16	25	Not tuberculosis	
1578	....do	....do	3	Nov. 7	16	....do	
1598	....do	Milk	5	Dec. 3	42	No lesions	
1599	....do	....do	3	Dec. 5	44	....do	

Cow No. 91. St. Elizabeth herd.

Age, 5 years; condition, fair; number of calves, 2; breed, grade Holstein; origin, raised.

Physical examination, September 25, 1900: Pulse, 46; respiration, 19; temperature, 100.7°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.4°	105.3°
9 a. m	101.2	106.4
12 m	100.8	105.8
3 p. m	101.2	106.1
6 p. m	102.4	105.4

Postmortem, Benning, D. C., March 8, 1901: Several calcareous areas from one-half to 1 inch in diameter are seen in principal lobes of both lungs. Posterior mediastinal glands are all enlarged, especially the caudal node, and contain calcareous foci varying from the size of a pea to a shellbark. Liver contains two nodules the size of a walnut filled with caseous tubercular material slightly calcareous in the center.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
155a	July 9 to Sept. 4	80	Sept. 4	57	Not tuberculosis	
156a	....do	80	....do	57	....do	
157a	July 9 to Sept. 24	80	Sept. 24	77	....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of leisons.
			c. c.				
172	Aug. 27	Milk	3	Dec. 11	106	No lesions	
173	....do	....do	2	Sept. 25	29	Not tuberculosis	
174	....do	Cream	3	Sept. 24	28	....do	
175	....do	....do	2	Oct. 4	39	....do	

SECOND SERIES.

1575	Oct. 20	Milk	5	Dec. 20	61	No lesions	
1576	....do	....do	3	Dec. 22	63	....do	
1581	Oct. 22	Cream	5	Dec. 5	46	Not tuberculosis	
1582	....do	....do	3	Dec. 15	56	....do	

Cow No. 92. St. Elizabeth herd.

Age, 8 years; condition, thin, poor feeder; number of calves, 4; breed, grade; origin, bought in Virginia six months before test.

Physical examination: Pulse, 66, and weak; respiration, 27; temperature, 103.1°. Superficial lymph glands, normal. Edema of the dewlap. Diagnosis: Traumatic pericarditis on November 22, 1900.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	102°	102°
9 a. m	101.1	104.2
12 m	100.1	105.3
3 p. m	100.8	105.4
6 p. m	101.9	104.6

Postmortem, Rosslyn, Va., December 11, 1900: Small calcareous nodule one-half inch in diameter in principal lobe of right lung; small caseous foci in cephalic lobe. Left lung shows a tuberculous mass, with completely degenerated contents, along entire posterior border of caudal lobe. The bronchial glands contain several necrotic foci. Anterior and posterior mediastinal glands affected with old tubercular deposits that appear gritty on section. Pericarditis with fibrous mass connecting reticulum to the diaphragm resulting from a foreign body, which was found.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
73a	July 9 to Oct. 9	80	Dec. 15	159	Normal	
74a	.....do	80	Dec. 4	148	.....do	
75a	.....do	80	Oct. 15	98	No marked lesions	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
160	Aug. 25	Milk	3	Dec. 15	112	No lesions	
161	....do	.....do	2	Nov. 5	72	.....do	
162	....do	Cream	3	Dec. 4	101	.....do	
163	....do	.....do	2	Sept. 1	7	Peritonitis	

SECOND SERIES.

Cow dry.

Cow No. 93. St. Elizabeth herd.

Age, 7 years; condition, good; number of calves, (?); breed, grade; origin, bought four years ago.

Physical examination, October 18, 1900: Pulse, 38; respiration, 20; temperature, 101°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a.m	101.6°	103.6°
9 a.m	100	105.4
12 m	100.2	105.8
3 p.m	101.9	104.7
6 p.m	101.8	104.2

Postmortem, Rosslyn, Va., December 11, 1900: The right lung shows a few nodules in the cephalic lobe of a soft, cheesy character from one-third to 1 inch in diameter. The ventral lobe contains a tuberculous area about the size of a hen's egg, with disintegrated contents and surrounded by hyperemic tissue.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
76a	July 9 to Oct. 9	80	Oct. 21	104	No lesions	
77a	July 9 to Oct. 6	80	Oct. 6	89	Not tuberculosis	
78a	July 9 to Oct. 9	80	Dec. 1	145	No lesions	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
165	Aug. 25	Milk	2	Sept. 15	21	Not tuberculosis	
166	....do	Cream	8	Nov. 2	69	No lesions	
167	....do	.....do	2	Nov. 4	71	.....do	

SECOND SERIES.

1579	Oct. 20	Milk	5	Nov. 18	29	No marked lesions	
1580	....do	......do	3	Dec. 17	58	No lesions	
1592	Oct. 22	Cream	5	Nov. 26	35	Not tuberculosis	
1593	....do	.....do	3	Dec. 13	52	No lesions	

Cow No. 94. St. Elizabeth herd.

Age, 8 years; condition, fair, losing flesh; number of calves, (?); breed, grade; origin, bought six months before test.

Physical examination, December 4, 1900: Pulse, 60; respiration, 24; temperature, 102.2°. Bad cough. Superficial lymph glands, normal. Lungs: Percussion, apparently normal; auscultation—right lung, râles posterior superior third; left lung, apparently normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a.m	101.9°	103.6°
9 a.m	102	105.6
12 m	101.4	106.4
3 p.m	101.6	105
6 p.m	101.8	103.1

Postmortem, Rosslyn, Va., December 21, 1900: Greater portion of principal lobes of both lungs contain tubercular areas from size of a walnut to that of a hen's egg, of caseous consistence. Bronchial lymphatic glands are slightly enlarged and contain calcareous foci of tuberculous material from one-eighth to one-third inch in diameter.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
77a	July 9 to Oct. 9	80	Oct. 27	110	Normal	
78a	.....do	80	Nov. 19	133	.....do	
79a	.....do	80	Dec. 12	156	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
152	Aug. 24	Milk	3	Oct. 29	66	No lesions	
153	....do	.....do	2	Oct. 28	65	Not tuberculosis	
154	....do	Cream	3	Sept. 30	37	.....do	
155	....do	.....do	2	Aug. 30	6	Hepatic abscess	Negative.

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1594	Oct. 20	Milk	3	Dec. 12	53	No lesions	
1595	....do	.....do	5	Dec. 17	58	....do	
1596	....do	Cream	5	Nov. 27	38	Not tuberculosis	
1597	....do	.....do	3	Dec. 13	54	No lesions	

Cow No. 95. St. Elizabeth herd.

Age, 10 years; condition, thin and delicate; number of calves, (?); breed, common; origin, bought three years ago.

Physical examination, September 19, 1900: Pulse, 41; respiration, 24; temperature, 101.8°. Superficial lymph glands, normal. Lungs: Percussion, normal; auscultation, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.6°	101.6°
9 a. m	102	103
12 m	101	105
3 p. m	100.7	105.9
6 p. m	102.3	105.5

Postmortem, Rosslyn, Va., December 21, 1900: The caudal lobe of right lung contains 5 caseous nodules the size of walnuts, arranged in a cluster along the dorsal margin. Anterior and posterior mediastinal glands show a few miliary foci undergoing necrotic changes. Right retropharyngeal gland is enlarged and has completely undergone a cheesy degeneration.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
80a	July 9 to Oct. 7......	80	Oct. 7	90	Not tuberculosis............	
81a	July 9 to Sept. 13....	80	Sept. 13	66	Pneumonia..................	
82a	July 9 to Oct. 9......	80	Oct. 20	103	Not tuberculosis............	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
156	Aug. 24	Milk............	3	Oct. 15	52	Normal...............	
157	....do...	.....do..........	2	Oct. 26	63	.....do................	
158	....do...	Cream..........	3	Nov. 3	71	.....do................	
159	....do...	.....do..........	2	Sept. 23	30	Not tuberculosis......	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1457	Oct. 20	Milk............	5	Dec. 15	56	No lesions............	
1590	....do...	.....do..........	5	Dec. 18	59	.....do................	
1591	....do...	.....do..........	3	Dec. 26	67	.....do................	
1600	Oct. 22	Cream..........	3	Jan. 24	94	.....do................	
1601	....do...	.....do..........	5	Jan. 25	95	.....do................	

Cow No. 96. St. Elizabeth herd.

Age, 6 years; condition, unthrifty; number of calves, 3; breed, Holstein; origin, raised.

Physical examination, October 25, 1900: Pulse, 42; respiration, 23; temperature, 102.6°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m..............................	102.1°	102.8°
9 a. m..............................	101.8	105
12 m..................................	101.6	106.1
3 p. m..............................	102	106.6
6 p. m..............................	102.8	105.4

Postmortem, Fowlers, D. C., April 12, 1901: Four caseous foci in principal lobe of left lung from the size of a walnut to a hen's egg. One area in posterior part of right principal lobe the size of a walnut containing gritty particles. One small focus of a cheesy nature one-fourth inch in diameter in right posterior pharyngeal gland.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
83a	July 9 to Oct. 9	80	Dec. 12	156	Normal	
84a	.....do	80	Nov. 9	123	.....do	
85a	.....do	80	Nov. 10	124	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
144	Aug. 23	Milk	3	Nov. 22	91	Normal	
145	....do	.....do	2	Oct. 12	50	.....do	
146	....do	Cream	3	Sept. 29	37	Not tuberculosis	
147	....do	....do	2	Sept. 23	31	.....do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1603	Oct. 22	Milk	3	Dec. 9	48	Normal	
1604	....do	Cream	5	Nov. 25	34	Not tuberculosis	
1605	....do	.....do	3	Nov. 3	12	Hepatic abscess	Negative.

Cow No. 97. St. Elizabeth herd.

Age, 6 years; condition, good; number of calves, 3; breed, Holstein; origin, raised. Physical examination, October 10, 1900: Pulse, 38; respiration, 21; temperature, 101.8°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	102.1°	107°
9 a. m	101.8	107.5
12 m	101.8	106
3 p. m	102	107.2
6 p. m	102.2	104

Postmortem, Fowlers, D. C., April 12, 1901: Several caseous nodules, three-fourths to 2½ inches in diameter in principal lobes of both lungs having thick, strong encapsulating walls. Right bronchial gland is greatly enlarged, and contains a disintegrated mass of tuberculous material.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
86a	July 9 to Aug. 12	80	Aug. 12	34	No marked lesions	
87a	July 9 to Oct. 9	80	Oct. 19	102	Not tuberculosis	
88a	July 9 to Aug. 6	80	Aug. 6	28	Ruptured stomach	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
148	Aug. 23	Milk	3	Dec. 17	116	Normal	
149	....do...	.....do	2	Aug. 29	6	Abscess at point of inoculation.	
150	....do...	Cream	3	Sept. 6	14	No lesions	
151	....do...	.....do	2	Sept. 27	35	Not tuberculosis	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1607	Oct. 22	Milk	3	Dec. 20	59	Pneumonia	Negative.
1608	....do...	Cream	5	Oct. 24	2	Septicemia	
1609	....do...	.....do	3	Jan. 9	79	No lesions	

Cow No. 98. St. Elizabeth herd.

Age, 7 years; condition, good; number of calves, 4; breed, Holstein; origin, raised.

Physical examination, October 25, 1900: Pulse, 38; respiration, 20; temperature, 102.1°. Superficial lymph glands, normal. Lungs: Percussion, apparently normal; auscultation, right lung, apparently normal; left lung, apparently normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a.m	101.9°	103°
9 a.m	101.8	104.6
12 m	101.6	105.3
3 p.m	101.8	105.6
6 p.m	102.2	102.9

Postmortem, Fowlers, D. C., April 12, 1901: The lungs are filled with tuberculous nodules that have become confluent in both caudal and the left cephalic lobes. In the left caudal lobe a large abscess cavity is seen that involves a large bronchus. The mucous membrane of the trachea contains two or three tuberculous ulcers and nodules from the size of a dime to that of a half dollar. The anterior and posterior mediastinal glands are greatly swollen and show caseous degeneration. The tonsils are also enlarged and contain caseous material. One nodule under the mucous membrane on the posterior superior surface of the tongue was found tuberculous on microscopic examination.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
89a	July 9 to Oct. 9	80	Nov. 13	127	Not tuberculosis	
90a	.....do	80	Nov. 19	133	Normal	
91a	.....do	80	....do...	133	....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected. c. c.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
168	Aug. 27	Milk	3	Sept. 21	25	Not tuberculosis	
169	....do...	.....do	2	Nov. 6	71	No lesions	
170	....do...	Cream	3	Sept. 26	30	Not tuberculosis	
171	....do...	.....do	2	Sept. 15	19	Hepatic abscess	Negative.

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected. c. c.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1611	Oct. 22	Milk	3	Dec. 15	54	No lesions	
1681	....do...	.....do	5	Nov. 26	35	Tuberculosis	Positive.
1682	....do...	Cream	3	Nov. 24	33	.....do	Do.

Cow No. 99. St. Elizabeth herd.

Age, 7 years; condition, good; number of calves, 4; breed, Holstein; origin, raised.

Physical examination, October 10, 1900: Pulse, 52; respiration, 21; temperature, 101.8°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.8°	104°
9 a. m	102	105
12 m	101.4	103.4
3 p. m	101.8	103.4
6 p. m	102.5	101.4

Postmortem, Rosslyn, Va., February 1, 1901: Posterior portion of principal lobe of right lung contains one large tuberculous region 5 inches long by 3 inches wide, which protrudes as if separated by a retaining band from the normal lung tissue. The contents are completely degenerated and semifluid in consistence. The trachea shows four circumscribed abscesses the size of shellbarks along its external anterior border following the course of the lymphatic vessels, and a suppurating ulcer on the mucous membrane. Both retropharyngeal glands are enlarged, the left containing three necrotic centers, while the right is completely degenerated and gritty on section. The right bronchial gland is the size of a duck's egg and likewise calcified. Several retention cysts in the udder.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily. c. c.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
92a	July 9 to Oct. 9	80	Nov. 2	116	Not tuberculosis	
93a	.....do	80	Nov. 7	121	.....do	
94a	.....do	80	Dec. 21	165	Normal	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
132	Aug. 21	Milk	3	Nov. 1	72	Normal	
133	....do	.....do	2	Sept. 28	38	Pneumonia	
134	....do	Cream	3	Oct. 16	56	Normal	
135	....do	.....do	2	Oct. 22	62	.....do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1643	Oct. 24	Milk	5	Dec. 20	57	Normal	
1644	....do	.....do	3	Jan. 10	78	.....do	
1645	....do	Cream	5	Jan. 17	85	.....do	
1646	....do	.....do	3	Nov. 19	26	Not tuberculosis	

Cow No. 100. St. Elizabeth herd.

Age, 7 years; condition, good; number of calves, (?); breed, grade; origin, bought three years ago.

Physical examination, September 11, 1900: Pulse, 38; respiration, 20; temperature, 101°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.6°	101.7°
9 a. m	101.3	102.2
12 m	101.2	104.1
3 p. m	101.2	103.9
6 p. m	101.7	102.6

Postmortem, Fowlers, D. C., April 12, 1901: The principal lobe of left lung contains a caseous tuberculous focus three-fourth inch in diameter, surrounded by hyperplastic tissue. Both right and left bronchial glands are enlarged, and show three or four tubercular foci about one-fourth inch in diameter, undergoing calcification.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
95a	July 9 to Oct. 9	80	Dec. 17	161	No lesions	
96a	.....do	80	Dec. 15	159	.....do	
97a	.....do	80	Dec. 26	170	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
136	Aug. 21	Milk	3	Sept. 16	26	Not tuberculosis	
137	....do	.....do	2	Nov. 20	91	No lesions	
138	....do	Cream	3	Sept. 4	14	Not tuberculosis	
140	....do	.....do	2	Nov. 24	95	No lesions	

SECOND SERIES.

Cow dry.

Cow No. 102. St. Elizabeth herd.

Age, 7 years; condition, poor; number of calves, 3; breed, Holstein; origin, raised. Physical examination, September 30, 1900: Pulse, 64; respiration, 27; temperature, 101.8°. Superficial lymph glands, normal. Lungs: Percussion, right lung, areas of dullness, left lung, slight dullness over superior portion posterior lobe; auscultation, right lung, absence of breath sounds posterior inferior part, left lung, small sibilant râles surrounding areas of silence.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	100.8°	103.7°
9 a. m	101.1	105.4
12 m	101.3	105.1
3 p. m	102.4	104.6
6 p. m	102.9	104.7

Postmortem, Rosslyn, Va., December 21, 1900: The parenchyma of both lungs is permeated with numerous isolated and confluent tubercular areas varying from the size of a hemp seed to a large lemon, with caseous contents. All the nodes of the mediastinal chain are enlarged and contain caseous and calcareous material. Posterior part of pleura, both sides of diaphragm, and anterior part of peritoneum are studded with fresh tubercular excrescences. Liver is covered with tubercular nodules extending into parenchyma. Majority of mesenteric glands show tubercular foci from one-eighth to one-half inch in diameter, some caseous, others calcareous.

Microscopic examination of centrifugal sediment of milk, positive; of cream positive.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
99a	July 9 to Aug. 30	120	Aug. 30	52	Tuberculosis	Positive.
100a	July 9 to Oct. 9	120	Oct. 17	100	.....do	Do.

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
100	Aug. 17	Cream	3	Aug. 21	4	Peritonitis	
101	....do...	.....do	2	Dec. 27	132	No lesions	
102	....do...	Milk	3	Sept. 23	37	Tuberculosis	Positive.
103	....do...	.....do	2	Aug. 21	4	Peritonitis	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1647	Oct. 24	Milk	5	Nov. 23	30	Tuberculosis	Positive.
1648	....do...	.....do	3	Nov. 22	29	.....do	Do.
1649	....do...	Cream	5	Dec. 14	51	.....do	Do.
1650	....do...	.....do	3	Dec. 18	55	.....do	Do.

Cow No. 103. St. Elizabeth herd.

Age, 5 years; condition, fair; number of calves, 2; breed, Holstein; origin, raised.

Physical examination, September 11, 1900: Pulse, 50; respiration, 28; temperature, 101.9°. Glands: Submaxillaries, enlarged; supramammary, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101°	102.6°
9 a. m	101.1	106.2
12 m	101.6	107
3 p. m	101.4	106.2
6 p. m	102.8	105.6

Postmortem, Rosslyn, Va., February 1, 1901: The lungs show six or seven tuberculous areas, from the size of a pea to a pigeon's egg, scattered throughout the parenchyma. The posterior mediastinal glands contain four calcareous foci the size of hazelnuts well encapsulated. Both bronchial and anterior mediastinal glands show degenerated foci from one-eighth to one-half inch in diameter. Both submaxillary glands completely degenerated and the size of walnuts.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
101a	July 9 to Oct. 9	120	Nov. 3	117	Normal	
102a	.....do	120	Dec. 11	155	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
104	Aug. 17	Cream	3	Sept. 15	29	Chronic peritonitis	
105	....do...	.....do	2	Nov. 19	94	Normal	
106	....do...	Milk	3	Oct. 1	45	......do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1651	Oct. 24	Milk	5	Dec. 12	49	No lesions	
1652	....do...	.....do	3	Dec. 17	54	......do	
1653	....do...	Cream	5	Jan. 11	79	......do	
1654	....do...	.....do	3	Jan. 23	91	......do	

Cow No. 104. St. Elizabeth herd.

Age, 4 years; condition, good; number of calves, 2; breed, Holstein; origin, raised.

Physical examination, October 25, 1900: Pulse, 48; respiration, 24; temperature, 102.6°; M. M., normal; udder, palpation normal. Glands: Submaxillary, normal; supramammary, normal. Lungs: Percussion, apparently normal; auscultation, apparently normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.4°	104.8°
9 a. m	101.8	106.9
12 m	101	107.2
3 p. m	101.4	106.8
6 p. m	102.3	103

Postmortem, Rosslyn, Va., December 11, 1900: Apex of right lung contains a yellow caseous nodule the size of a walnut, well encapsulated. Left caudal lobe has four tuberculous areas from the size of a shellbark to an egg, which contain calcareous material. Great many grape-like clusters are sprinkled over entire left pleura and anterior surface of diaphragm. Right and left bronchial and anterior and posterior mediastinal glands are enlarged and degenerated with caseous contents. Left prepectoral gland of normal size, but shows three small necrotic foci. Left posterior pharyngeal gland slightly enlarged and undergoing cheesy degeneration. Liver shows numerous angiomata, otherwise normal.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
103a	July 9 to Sept. 12	60	Sept. 12	65	Tuberculosis	Positive.
104a	July 9 to Oct. 9	60	Nov. 26	140	Normal	
105a	.....do	60	Nov. 18	132	.....do	
106a	.....do	60	Oct. 26	109	Tuberculosis	Do.

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
124	Aug. 21	Milk	3	Sept. 24	34	Tuberculosis	Positive.
125	....do	.....do	2	Sept. 4	14	Pneumonia	Negative.
126	....do	Cream	3	Nov. 28	99	No lesions	
127	....do	.....do	2	Nov. 27	98	.....do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1655	Oct. 24	Milk	5	Dec. 20	57	No lesions	
1656	....do	.....do	3	Dec. 18	55	.....do	
1657	....do	Cream	5	Jan. 4	72	.....do	
1650	....do	.....do	3	Dec. 7	44	.....do	

Cow No. 105. St. Elizabeth herd.

Age, 9 years; condition, poor; number of calves, (?); breed, Holstein; origin, bought four years ago.

Physical examination, September 11, 1900: Pulse, 50; respiration, 23; temperature, 101°. Superficial lymph glands, normal. Lungs, apparently normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a.m	101.2°	104.2°
9 a.m	100.8	105.3
12 m	101.4	105.3
3 p.m	102.3	104.5
6 p.m	102.9	105

Postmortem, Rosslyn, Va., December 21, 1900: Parenchyma of both lungs studded with tuberculous nodules varying in size from one-half to 1½ inches in diameter. Costal pleura covered with isolated and confluent grape-like masses of tuberculous nature. These new formations are about one-half inch thick on the diaphragm, and seem of recent origin. The prepectoral glands show three caseous foci, one-fourth to three-eighths inch in diameter. Anterior and posterior mediastinal glands contain several hempseed-like areas that are calcareous.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
107a	July 9 to Oct. 9	80	Dec. 18	162	No lesions	
108a	.....do	80	Oct. 12	95	No marked lesions	
109a	.....do	80	Oct. 31	114	No lesions	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
128	Aug. 21	Milk	3	Aug. 26	5	Peritonitis	
129	....do	.....do	2	Oct. 3	43	Normal	
130	....do	Cream	3	Aug. 25	4	Peritonitis	
131	....do	.....do	2	Oct. 25	65	No lesions	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1659	Oct. 24	Milk	5	Dec. 24	61	Hepatitis	Negative.
1660	....do	.....do	3	Jan. 12	80	Normal	
1661	....do	Cream	5	....do	80	.....do	
1662	....do	.....do	3	Dec. 18	55	.....do	

Cow No. 106. St. Elizabeth herd.

Age, 6 years; condition, good; number of calves, 3; breed, Jersey; origin, raised.

Physical examination, December 4, 1900: Pulse, 46; respiration, 18; temperature, 102.2°. Hard fibrous tumor of actinomycosis on left lower jaw. Superficial lymph glands, normal. Lungs: Percussion, right lung, posterior third dull, left lung, apparently normal; auscultation, right lung, many mucous râles and loss of sound, left lung, apparently normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	101.3°	104.2°
9 a. m	101.8	106.2
12 m	100.8	106.3
3 p. m	101.5	106.3
6 p. m	101.2	104.5

Postmortem, Rosslyn, Va., December 17, 1900: Actinomycotic tumor the size of one's fist on left side of inferior maxilla involving the bone. No fistula could be found. Right retropharyngeal gland enlarged and contains caseous tubercular material. Posterior mediastinal and bronchial glands contain several tubercular foci. Posterior part of caudal lobe of right lung transformed into a tubercular mass. Two caseous foci in the ventral lobe the size of walnuts. Main lobe of left lung contains three or four degenerated areas from one-half to 1 inch in diameter.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
110a	July 9 to Sept 8	80	Sept. 8	61	Not tuberculosis	
111a	July 9 to Aug. 31	80	Aug. 31	53	.....do	
112a	July 9 to Oct. 9	80	Nov. 28	142	No lesions	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
116	Aug. 18	Milk	3	Dec. 15	119	No lesions	
117	....do	.....do	2	Sept. 29	42	Not tubercular	
118	....do	Cream	3	Oct. 1	44	.....do	
119	....do	.....do	2	Oct. 5	48	.....do	

SECOND SERIES.

1663	Oct. 24	Milk	5	Nov. 23	30	No lesions	
1664	....do	.....do	3	Dec. 19	55	.....do	
1722	Oct. 25	Cream	5	Dec. 22	58	.....do	
1723	....do	.....do	3	Dec. 18	54	.....do	

Cow No. 108. St. Elizabeth herd.

Age, 8 years; condition, good; number of calves, 4; breed, Holstein; origin, raised.

Physical examination, September 11, 1900: Pulse, 56; respiration, 23; temperature, 101.3°. Glands: Left submaxillary, size of walnut; supramammary, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a.m	101.6°	102.2°
9 a.m	100.9	103.1
12 m	102	105.2
3 p.m	101.2	105.9
6 p.m	102.4	104.6

Postmortem, Rosslyn, Va., December 17, 1900: On the dorsal margin of the left principal lobe is an irregular cluster of tubercular nodules in varying stages of degeneration, measuring from 2 to 3 inches in diameter. The main lobe of the right lung contains a nodule the size of a silver dollar that contains a semicalcareous material. The right bronchial gland shows five similar foci, while the entire mediastinal chain of lymph glands present numerous small firm tubercles, some showing caseation, others calcification.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
116a	July 9 to Oct. 9	80	Nov. 30	144	No lesions	
117a	.....do	80	Dec. 4	148	.....do	
118a	.....do	80	Jan. 9	184	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
120	Aug. 18	Milk	3	Sept. 6	19	Pneumonia	
121	....do	.....do	2	Nov. 5	79	No lesions	
122	....do	Cream	3	Nov. 23	97	.....do	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1667	Oct. 25	Milk	5	Nov. 23	29	Hepatitis	Negative.
1668	....do	.....do	3	Jan. 6	73	No lesions	
1669	....do	Cream	5	Jan. 3	70	.....do	
1670	....do	.....do	3	Oct. 27	2	Septicemia	

Cow No. 109. St. Elizabeth herd.

Age, 7 years; condition, rather poor; number of calves, 4; breed, grade Holstein; origin, raised.

Physical examination, October 18, 1900: Pulse, 38; respiration, 22; temperature, 101.9°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a. m	100.9°	101.8°
9 a. m	101	105
12 m	101.1	105.7
3 p. m	101.2	105.8
6 p. m	102.1	104.5

Postmortem, Fowlers, D. C., May 15, 1901: The parietal and pulmonary pleura are studded with numerous tuberculous neoplasms more or less confluent, forming what is commonly known as pearl disease. The ventral lobe of right lung contains a caseous area 2 inches in diameter opening into a bronchial tube. The mucous membrane of the trachea about 5 inches from its bifurcation shows a tuberculous ulcer. Three inches anterior to this are seen two other ulcers that have become confluent.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
128a	July 9 to Oct. 9	80	Nov. 12	126	Normal	
129a	.....do	80	Nov. 21	135	.....do	
130a	.....do	80	Nov. 10	124	.....do	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
			c. c.				
108	Aug. 14	Cream..........	3	Nov. 27	105	Normal...............	
109	....do...	.....do..........	2	Nov. 1	79	.....do..............	
110	....do...	Milk............	3	Sept. 5	22	Not tuberculosis......	
111	....do...	.....do..........	2	Oct. 15	62	Normal...............	

SECOND SERIES.

Guinea pig No.	Date of injection.	Material.	Dose injected.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1671	Oct. 25	Milk............	5	Jan. 3	70	Normal...............	
1672	....do...	.....do..........	3	Jan. 5	72	.....do..............	
1673	....do...	Cream..........	5	Jan. 27	93	.....do..............	
1674	....do...	.....do..........	3	....do...	93	.....do..............	

Cow No. 112. St. Elizabeth Herd.

Age, 6 years; condition, good; number of calves, 3; breed, Holstein; origin, raised.

Physical examination, October 18, 1900: Pulse, 48; respiration, 26; temperature, 101.3°. Superficial lymph glands, normal. Lungs, normal.

Tuberculin test.

Hour.	May 2, 1900. Before injection.	May 3, 1900. After injection.
6 a.m	100.6°	102°
9 a.m	101.2	103.1
12 m...	101	102.8
3 p.m	101.5	105.6
6 p.m	102	104.5

Postmortem, Fowlers, D. C., May 15, 1901: Few small caseous foci about one-fourth inch in diameter in principal lobe of right lung. Right bronchial gland slightly enlarged and contains two or three centers of caseous material. Posterior mediastinal glands are slightly enlarged with several caseated foci the size of a pea.

Microscopic examination of centrifugal sediment of milk, negative; of cream, negative.

Feeding experiments.

Guinea pig No.	Duration of experiment.	Amount fed daily.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
		c. c.				
158a	July 9 to Oct. 9.....	80	Nov. 15	129	No lesions....................	
159a	.....do..............	80	Dec. 27	171	Not tuberculosis............	
160a	.....do..............	80	Oct. 27	110	....do.........................	

Inoculation experiments.

FIRST SERIES.

Guinea pig No.	Date of injection	Material.	Dose injected. c. c.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
112	Aug. 17	Cream	3	Sept. 1	15	Not tuberculosis	
113	do	do	2	Sept. 23	37	do	
114	do	Milk	3	Sept. 21	35	Rupture of cecum	
115	do	do	2	Nov. 14	89	No lesions	

SECOND SERIES.

Guinea pig No.	Date of injection	Material.	Dose injected. c. c.	Date when killed or died.	Number of days alive.	Postmortem diagnosis.	Microscopic examination of lesions.
1675	Oct. 25	Milk	5	Nov. 23	29	Not tuberculosis	
1676	do	do	3	Nov. 30	36	do	
1677	do	Cream	5	Nov. 16	22	Hepatic abscess	Negative.
1678	do	do	3	Dec. 15	51	No lesions	

In order to show more conveniently and also more vividly the positive results obtained from those cows that were found to be excreting tubercle bacilli in the milk, the following synthetical table is appended:

Summary of cows secreting tuberculous milk, with the results of microscopic examination.

Number of cow.	Lesions of guinea pig fed.	Centrifugalized milk.	Centrifugalized cream.	Lesions of guinea pig injected, first series.	Lesions of guinea pig injected, second series.
4	Positive	Negative	Negative	Positive	Negative.
10	Negative	Positive	do	Negative	Do.
12	do	Negative	do	do	Positive.
15	Positive	do	do	Positive	Negative.
64	Negative	do	do	do	Positive.
65	Positive	Positive	Positive	Negative	Do.
71	do	Negative	Negative	do	Do.
73	do	do	do	do	Do.
74	do	do	do	do	No inoculation.
77	do	Positive	do	Positive	Do.
98	Negative	Negative	do	Negative	Positive.
102	Positive	Positive	Positive	Positive	Do.
104	do	Negative	Negative	do	Negative.

The above synopsis of positive results obtained from the feeding and inoculation experiments, as well as from the microscopic examination of the centrifugalized sediment of milk and cream, indicates that one or more of the guinea pigs fed with milk from 9 different cows have succumbed with typical tuberculosis; that is, the milk of 16.07 per cent of the 56 reacting cows has been found to be pathogenic to guinea pigs when fed to them. Of the experimental animals inoculated intraabdominally in the first series, at least 1 guinea pig has died of tuberculosis in each of 6 different instances, showing that the milk of 10.9 per cent of the 55 reacting cows in this experiment has proven fatal to guinea pigs in the first inoculation experiment. In the second series of intraabdominal injections the milk from 7 individual cows out of 45 examined, or 15.5 per cent, was demonstrated to possess virulent tubercle bacilli. By uniting these inoculation results it will be observed that 11 out of 55 cows, or 20 per cent, secreted milk which transmitted tuberculosis to one or more experimental animals when injected into the peritoneal cavity.

Owing to the greater percentage of positive results obtained from the second inoculation experiment, conducted more than two months after the first intraabdominal test, it appears probable, as would be expected, that the virulence of milk increases with the advancement of the disease in the cow. The lack of uniformity of results obtained in many of the cows might be explained from our knowledge that tubercle bacilli are not excreted by the normal udder with any degree of constancy. For this reason the continuous feeding experiment, covering a period of three months, seems to have more practical value in demonstrating the transmission of tuberculosis than the inoculation test, where the only possibility of affirmative results must depend on the contingency of the accidental excretion of the bacilli on one particular day.

The combined results of the ingestion and inoculation experiments show that the milk of 12 out of 56 reacting cows, or 21.4 per cent, has at one time or another since the beginning of the experiment contained virulent tubercle bacilli.

Cover-glass preparations of the centrifugalized sediment of milk from 4 out of 55 cows, or 7.2 per cent, revealed the presence of the tubercle bacillus, and in 2 of these cases the centrifugalized cream was also found to possess this organism. In one case (cow No. 10) tubercle bacilli were demonstrated only by microscopic examination of the centrifugalized milk sediment. The number observed was very scarce, 3 in one slide and but 1 in another, while the remaining 9 cover glasses were apparently free from this bacillus. It appears singular that positive results were not obtained by the intraabdominal injection of this sediment from which the cover glasses showing the tubercle bacilli were made. Wyssokowitsch in his experiments regarding the quantity of bacilli requisite for the production of tuberculosis by injection into the peritoneal cavity, found that it required at least 30 bacilli for the transmission of the disease. Granting this conclusion, it is evident that the milk injected either did not contain a sufficient number of bacilli to cause the disease or that the bacilli were less vigorous or the guinea pigs more resistant than in the other experiments. It is also of interest to know that of the guinea pigs that succumbed to tuberculosis as a result of intraabdominal inoculation, 7 were injected with a mixture of milk and cream, 5 with centrifugalized cream alone, and the remaining 8 with the milk sediment.

With one cow (No. 102) positive results were obtained in all the tests—that is, by ingestion, by inoculation, and by microscopic examination of the sediment of the milk and cream—although but 7 of the 10 experimental animals fed and inoculated with the milk of this cow became tubercular. At the beginning of the investigation the cow was in apparently good condition, but late in September stethoscopic râles could occasionally be heard which gradually became more perceptible. She became unthrifty, fell off in flesh, and gave strong clinical evidence of tuberculosis. Early in September mucous râles were observed by auscultation of the lungs of cow No. 65. A similar unthriftiness and loss of flesh were observed as noted in the previous animal and before the experiment was concluded she was a mere skeleton. With these exceptions, the cows from which positive results were obtained appeared in good condition without manifesting any clinical symptoms of tuberculosis while the experiment was being conducted. During this period a physical examination of all the cows was made on frequent occasions and the first evidence of clinical symptoms has been noted in the physical examination described in the preceding tables (pp. 26 to 78). In comparing the virulence of the milk with the extent of the postmortem lesions found in the cows, the latter may be arranged in three classes. The first group would include those animals that have shown physical evidences of tuberculosis during the experiment and would embrace cows Nos. 65 and 102. The second group comprises the cattle in which the postmortem lesions were extensive, and generalized, but in which no apparent physical symptoms could be observed during the experiment, and includes cows Nos. 10, 12, 15, 64, 71, 73, 74, and 77. In the third class the lesions were found to be extensive but confined to the respiratory tract and contains cows Nos. 4, 98, and 104.

It is with the last two classes of cows which are in apparently good condition, but which occasionally excrete tubercle bacilli, that the great danger remains hidden and which demands that all milk from tubercular cows should be sterilized before using. The lesions of tuberculosis were in the majority of cases of such a nature that a short prolongment of their lives might probably have placed them in the first group.

Moreover, from a review of the postmortem notes it will be seen that some cows which gave negative results in the milk experiments were as markedly diseased as some that gave positive results. This is of interest in showing the great uncertainty attached to the intelligent selection of cows producing tuberculous milk by any method other than the unfeasible one of microscopic examination, or what is far better, though equally impracticable, the animal inoculations of the milk from each individual cow. And it likewise indicates the danger involved in drawing conclusions from experiments with a few cattle such as would include these negative cases to the exclusion of others no more diseased but nevertheless secreting infectious milk.

It should also be remembered, in comparing the disease found on postmortem examination with the virulence of the milk secreted, that the cows were permitted to live from two to thirteen months following the investigation, and it is but logical to presume that, on the whole, the disease was less marked at the time of the experiment than on the date of the postmortem.

Specimens of the mammary glands from all the above-mentioned cows were brought to the laboratory and histological examination made, but without finding any indication of tuberculosis. Special attention was given to the udder of cow No. 102, and numerous serial sections were examined with entirely negative results.

Owing to the uncertainty of diagnosing the extent of tuberculosis in a reacting animal, the impossibility of saying at what moment a latent, incipient, or localized infection may develop into a generalized or extensive case with probable involvement of the mammary gland, and to the further fact that it is difficult to recognize the beginning of tuberculosis in the udder, it behooves one to look at least with suspicion upon the milk of all tuberculous cows. It is a strongly suggestive fact that many cases of tuberculosis of the supramammary lymph glands in which there may be no evident udder lesion can hardly be explained without assuming that the bacilli had entered from the lymphatics of the mammæ. Furthermore the great prevalence and constant increase of tuberculosis among hogs fed upon the by-products from dairies and creameries point forcibly to the milk as the means by which the disease is transmitted and disseminated. It may also be worth mentioning in this connection that Bang considers it possible for milk to retain its normal appearance for at least a month after the udder shows tuberculous involvement.

The result of this investigation demonstrated fully the necessity for thorough sterilization of the milk from reacting cows before it was consumed as food, and precautions of this nature were at once observed by the asylum authorities. The danger to the consumer of this raw milk seems palpable, although it is not assumed to be in direct proportion to the positive results obtained in such susceptible animals as guinea pigs.

SUPPRESSION AND ERADICATION.

In dealing with the question of the eradication of tuberculosis from this herd in order to obtain a permanent supply of hygienic milk, several courses were possible of adoption, and they were presented to the superintendent of the asylum, as follows:

> The quickest and most radical method would be to destroy all of the affected animals and to substitute fresh tuberculin-tested cows. This would, however, involve a great and immediate outlay of money and would necessitate a thorough disinfection and partial reconstruction of the present premises. It would also require constant vigilance and semiannual tuberculin tests in order to discover incipient cases of tuberculosis and to eliminate them before they become dangerous to the health of the remaining animals.
>
> Another method would be to dispose of those animals whose milk had been found to contain virulent tubercle bacilli and to retain the remainder of the reacting cows for breeding and dairy purposes. All calves born from these cows should then be

tested with tuberculin shortly after birth, and, when found free from the disease, should be removed to the stable in which the nonreacting cows are kept and be brought up on sterilized milk or on milk from nonreacting cows. In this case it would only be necessary to substitute the 13 above-mentioned cows that were secreting tuberculous milk with tuberculin-tested animals. The sterilization of the milk from the reacting cows should, however, be continued, and constant veterinary supervision would be required for the purpose of eliminating cases which on physical examination are judged to have passed from the incipient into a dangerous stage.

Finally, the present condition might be allowed to continue and only such cows be disposed of which, in the opinion of the farm superintendent, did not pay for their keep. All newly born calves should be dealt with in the same manner as above described. This method of eradicating tuberculosis, known as the Danish method, has been found to be practical, but requires, under the best circumstances, four or five years.

In either of the two latter cases the greatest drawback is the necessity for keeping two distinct herds with separate attendants, implements, and dairy utensils. The premises at the asylum are, however, well adapted for the carrying out of either of these plans, there being two separate stables, each with an adjoining lot.

A fourth plan would be to turn the entire dairy department of the asylum over to a private party or syndicate, the asylum agreeing to pay a certain price per gallon for the milk, and the lessees to provide tuberculin-tested cows and to keep them under such sanitary conditions as the superintendent of the asylum would deem necessary in order to obtain a good quality of pure milk.

After due consideration of these various propositions by the asylum authorities, it was decided to adopt the first method of eradicating the disease. With this in view the animals in the infected barn were gradually slaughtered as they became dry until the herd had been reduced sufficiently to occupy but one-half of the stable. This portion of the stable was then boarded up tightly while the other half was being torn out and reconstructed. The entire floor, as well as the supporting beams, were replaced; new windows were located along the sides, and every painstaking effort was directed toward the production of a strictly hygienic stable. Individual mangers and stanchions were constructed and the entire woodwork, with the exception of the floor, was given two coats of paint. This thoroughness in cleaning out the possible danger of reinfection was likewise adopted in renovating the other half of the stable after the last tuberculous animal had been slaughtered.

As already stated, it was decided to concentrate the expense connected with the eradication of such an extensive infection in the herd and dispose of all the reacting cows. In all cases the cows were sold to local butchers, subject to the postmortem examination of the District health officer. Only the carcasses of those animals in which the disease was localized or in an incipient stage were passed as fit for food. Brief notes regarding the history and postmortem examination of the cows reacting to the first tuberculin test, but not in the milk experiment, follow:

Cow No. 21.—Grade, Holstein; 5 years old; raised; in good condition; weight, 910 pounds.

Postmortem at Fowlers, D. C., April 8, 1901: Three small nodules of caseous material in each posterior pharyngeal gland. One small focus in right bronchial gland. Carcass passed.

Cow No. 22.—Red; common stock; 7 years old; bought two years ago; apparently in normal condition; weight, 840 pounds.

Postmortem at Fowlers, D. C., April 4, 1901: One small focus in right retropharyngeal gland. One nodule, size of a pigeon's egg, in right cephalic lobe and four foci, containing cheesy deposit, in ventral lobe of left lung. Carcass passed.

Cow No. 23.—Black Holstein heifer; 3 years old; raised; in fair condition; weight, 610 pounds.

Postmortem at Rosslyn, Va., March 8, 1901: Left lung contains a number of small foci in posterior portion of ventral lobe. Posterior mediastinal gland considerably enlarged and contains three or four encysted foci that have undergone calcareous degeneration. Carcass passed.

Cow No. 24.—Dark brindle; 9 years old; purchased three years ago; in ordinary condition; weight, 970 pounds.

Postmortem at Rosslyn, Va., February 1, 1901: Right bronchial lymph gland greatly enlarged and degenerated. Entire posterior mediastinal chain of glands contains nodules. Right lung shows caseous areas throughout entire parenchyma. Left lung contains four or five foci, principally in ventral lobe. Liver has three tuberculous foci about the size of a hazelnut in the parenchyma and several neoplasms adhering to the capsule. One mesenteric gland contains two pea-sized foci. The right anterior quarter of the udder on cross section appears indurated and knotty with miliary foci and yellowish lines of tuberculous material following the course of the lacteals. The mucous membrane of the milk cistern contains several tubercles, but the supramammary lymph glands are apparently not involved. A microscopic examination of cover-glass preparations made from the udder shows tubercle bacilli. Carcass condemned.

Cow No. 25.—Holstein grade; 7 years old; raised; has been a good feeder, but going back recently; weight, 960 pounds.

Postmortem at Rosslyn, Va., February 1, 1901: Right lung has a focus in its apex the size of a pea. Right bronchial gland enlarged and caseous. Posterior mediastinal gland contains several miliary foci of caseous material. Liver shows three large caseous abscesses, size of a hen's egg and containing putrid pus. Spleen is adherent by dense fibrous tissue to the paunch and contains an abscess with foul-smelling contents. Large fibrous mass attached to diaphragm and paunch is also seen in which a foreign body is embedded. Carcass condemned.

Cow No. 26.—Holstein heifer; 2 years old; raised; in good condition; weight, 690 pounds.

Postmortem at Rosslyn, Va., February 1, 1901: Six or seven mesenteric glands enlarged and contain a number of foci in various stages of degeneration. Mucous membrane of the intestinal tract normal. Liver normal. Carcass passed.

Cow No. 27.—Red heifer; 3 years old; raised; no evidence of tuberculosis on physical examination, but animal has not been doing well; weight, 615 pounds.

Postmortem at Rosslyn, Va., February 1, 1901: Posterior mediastinal glands greatly enlarged and filled with calcareous material. Right bronchial gland has several calcareous foci. Numerous miliary tubercles in apex of right lung. Carcass condemned.

Cow No. 28.—Holstein grade; 5 years old; raised; in good flesh and thrifty; weight, 870 pounds.

Postmortem at Rosslyn, Va., February 1, 1901: Several small foci about size of hazelnut in ventral lobe of left lung. Small tubercular nodule in posterior mediastinal gland. Carcass passed.

Cow No. 29.—Red buffalo; common stock; 7 years old; bought three years ago; poor feeder and falling off in flesh; weight, 735 pounds.

Postmortem at Rosslyn, Va., February 1, 1901: Large tubercular mass in caudal lobe of right lung which appears adherent to the diaphragm. Two small nodules are observed in the ventral lobe of left lung. Right bronchial gland enlarged and completely degenerated. Liver is studded with various-sized neoplasms. Several mesenteric glands enlarged and contain tuberculous areas. Carcass condemned.

Cow No. 30.—Red buffalo; common stock; 7 years old; bought three years ago; poor feeder and falling off in flesh; weight, 690 pounds.

Postmortem at Rosslyn, Va., February 1, 1901: Both anterior and posterior mediastinal glands enlarged and contain cheesy material. The right ventral lobe contains a large abscess filled with tuberculous pus, surrounding which are smaller nodules containing caseous matter. One of the nodes in the mesenteric chain is enlarged and shows an incipient focus. Carcass condemned.

RETEST OF TWENTY-SIX COWS IN DRY BARN.

Six months having elapsed since the nonreacting cows were placed under sanitary conditions in the renovated small barn, it was deemed advisable to again subject them to the tuberculin test in order to discover if tuberculosis had been latent in any of the cows at the time of the first injection. Of the 26 cows injected, 25 had failed to react in the previous test (see p. 9), while the remaining cow (No. 421) was near the end of the period of gestation at the time the first injection was made. The result of the second test (see below) shows that 8 of the previous nonreacting cows gave a decided reaction, while No. 421 failed to respond. These reacting animals were at once removed to the infected barn and the stalls previously occupied by them thoroughly cleaned and disinfected. As several were milking well they were not disposed of at once, but were continued in the dairy for varying periods and their milk thoroughly sterilized before using.

Retest of 26 cattle on November 25 and 26, 1900, which did not react when the entire St. Elizabeth herd was first tested, May 2 and 3, 1900.[a]

Number of cow.	Temperature taken.	6 a. m.	9 a. m.	12 m.	3 p. m.	6 p. m.	9 p. m.
No. 359	Nov, 25	102.0°	101.6°	101.8°	101.8°	101.1°	102.0°
	Nov. 26	101.4	101.2	100.2	101.4	101.0	100.4
No. 360	Nov. 25	101.2	101.2	101.0	101.7	101.2	101.2
	Nov. 26	101.4	101.0	101.2	100.6	101.2	101.0
No. 361	Nov. 25	102.5	102.6	102.2	101.2	101.0	101.4
	Nov. 26	102.0	101.8	102.0	102.9	102.7	102.5
No. 362	Nov. 25	101.6	101.5	102.3	102.3	101.6	101.9
	Nov. 26	104.7	105.8	107.0	106.7	106.0	106.4
No. 363	Nov. 25	102.0	101.6	101.8	101.8	101.9	101.6
	Nov. 26	102.1	103.6	105.7	106.3	105.6	105.2
No. 364	Nov. 25	102.0	101.8	101.6	101.8	101.4	101.6
	Nov. 26	102.9	104.2	106.9	106.6	105.6	105.3
No. 365	Nov. 25	100.8	102.0	101.6	101.8	102.0	102.0
	Nov. 26	101.7	101.6	101.4	102.0	102.4	103.0
No. 366	Nov. 25	101.4	101.2	101.0	101.4	100.6	102.0
	Nov. 26	101.5	101.1	101.4	102.0	102.4	103.0
No. 367	Nov. 25	102.0	101.8	101.4	101.2	101.5	101.6
	Nov. 26	101.6	101.5	101.4	101.4	101.4	101.2
No. 368	Nov. 25	101.6	101.5	101.0	101.4	102.0	101.0
	Nov. 26	101.5	101.4	101.0	101.6	101.5	101.4

[a] Tuberculin injections made at 10 p. m., November 25.

Retest of 26 cattle on November 25 and 26, 1900, which did not react when the entire St. Elizabeth herd was first tested, May 2 and 3, 1900—Continued.

Number of cow.	Temperature taken.	6 a. m.	9 a. m.	12 m.	3 p. m.	6 p. m.	9 p. m.
No. 369	Nov. 25	101.5°	101.4°	101.6°	101.7°	101.4°	101.7°
	Nov. 26	101.6	101.6	101.6	101.7	101.6	101.3
No. 370	Nov. 25	102.0	100.6	101.4	101.3	100.7	100.6
	Nov. 26	101.5	101.5	101.6	101.7	101.0	101.2
No. 371	Nov. 25	100.6	101.0	100.6	100.0	102.0	100.2
	Nov. 26	101.2	101.4	101.4	102.5	102.2	101.6
No. **378**	Nov. 25	102.0	101.7	101.4	102.2	100.6	101.2
	Nov. 26	101.3	101.4	101.8	105.0	105.7	104.6
No. 379	Nov. 25	101.5	101.6	101.4	101.4	101.5	101.0
	Nov. 26	102.5	101.2	101.2	101.2	101.8	101.5
No. **380**	Nov. 25	103.2	102.2	101.4	100.5	101.0	101.2
	Nov. 26	102.7	102.8	105.2	104.1	103.0	103.3
No. 381	Nov. 25	101.7	102.0	101.6	101.5	101.2	101.8
	Nov. 26	101.8	101.5	101.5	101.6	101.4	102.4
No. **384**	Nov. 25	102.0	101.5	101.4	101.4	101.0	101.3
	Nov. 26	102.6	104.6	105.6	106.2	106.0	104.8
No. **419**	Nov. 25	101.6	101.8	101.4	101.4	100.6	101.0
	Nov. 26	103.0	104.8	105.8	105.2	103.6	103.0
No. 421	Nov. 25	101.6	101.7	101.5	100.8	101.5	101.4
	Nov. 26	101.4	101.5	101.2	101.2	101.6	101.0
No. 938	Nov. 25	101.5	100.0	100.9	100.8	101.0	101.2
	Nov. 26	101.4	101.0	100.8	101.2	101.0	100.8
No. 940	Nov. 25	102.2	102.0	102.0	101.8	101.0	101.2
	Nov. 26	102.0	102.0	101.5	101.6	102.0	101.0
No. **944**	Nov. 25	102.0	101.8	101.3	101.7	101.2	101.4
	Nov. 26	101.7	101.7	102.9	103.9	104.3	103.6
No. 954	Nov. 25	101.2	101.5	101.1	101.2	99.6	100.8
	Nov. 26	101.2	101.6	101.8	102.0	102.0	100.4
No. 959	Nov. 25	101.3	101.3	101.5	101.6	100.4	101.0
	Nov. 26	102.0	101.7	101.4	101.3	103.2	102.6
No. 960	Nov. 25	101.8	102.2	101.4	101.5	100.4	101.6
	Nov. 26	102.3	101.9	101.8	102.2	101.8	101.2

It will be seen that 8 of the above cattle gave a decided reaction, and they were at once segregated and placed in quarantine in the infected barn. Owing to the decision that a nontuberculous herd should be established, these animals were slaughtered from time to time, and a brief description of the cows, together with postmortem notes, are given below.

Cow No. 362.—Roan Shorthorn grade; 6 years old; bought three years ago; weight, 1,090 pounds; in good flesh and apparently in healthy condition.

Postmortem at Rosslyn, Va., March 8, 1901: A number of small tuberculous nodules in the posterior mediastinal gland containing a calcareous deposit in the center. Large abscess in liver, not tuberculous. Carcass passed.

Cow No. 363.—Grade Jersey; 6 years old; purchased one year ago; weight, 790 pounds; animal in fair condition and apparently healthy.

Postmortem at Bennings, D. C., March 19, 1901: Caseous nodules about the size of an acorn in the anterior portion of the left ventral lobe. The udder shows a fibrous induration of the posterior quarters and both supramammary glands are enlarged and watery, but a subsequent microscopic examination did not reveal the presence of the tubercle bacillus. Carcass passed.

Cow No. 364.—Roan Shorthorn grade; dehorned; 5 years old; bought three years ago; weight, 1,035 pounds; aborted November 2, 1900. In thrifty condition, but shows an enlarged submaxillary gland.

Postmortem at Rosslyn, Va., March 6, 1901: Left submaxillary gland enlarged, the size of a hen's egg, containing caseous deposit with calcareous center. One small calcareous tubercle in the posterior mediastinal gland. Carcass passed.

Cow No. 373.—Spotted Ayrshire grade; 12 years old; raised; animal appears normal and in fair condition; weight, 840 pounds.

Postmortem at Bennings, D. C., March 19, 1901: Principal lobes of both lungs show a number of nodules ranging in size from a hazelnut to a walnut. On section they are seen to have undergone cheesy degeneration. Right posterior pharyngeal gland is greatly enlarged, with contents caseated. Posterior mediastinal glands contain several small yellowish tubercles of a softened consistency. Carcass condemned.

Cow No. 380.—Blue roan; common stock; 9 years old; purchased in Virginia about eighteen months ago; animal appears thrifty and is a good milker.

Postmortem at Fowlers, D. C., April 18, 1901: Three small caseated centers of tuberculosis in right posterior pharyngeal lymph gland. Right bronchial gland greatly enlarged and completely degenerated. Contains a cheesy detritus with center slightly calcified. Carcass passed.

Cow No. 384.—Grade Shorthorn; 8 years old; bought three years ago; condition good; weight, 1,015 pounds.

Postmortem at Fowlers, D. C., May 19, 1901: The posterior mediastinal glands are enlarged and contain several soft, yellowish tubercles, varying from one-eighth to three-fourths of an inch in size. Left bronchial gland has an incipient focus of tuberculosis. The surface of the liver shows three or four necrotic areas, which do not reveal the tubercle bacillus on microscopic examination. Entire chain of mesenteric lymph glands appear normal. Carcass passed.

Cow No. 419.—Red; common stock; 3 years old; 1 calf; bought one year ago; in fair condition and appears to be thrifty; weight, 910 pounds.

Postmortem at Fowlers, D. C., May 31, 1901: Two small nodules, size of hazelnuts, in principal lobe of right lung and three similar foci in ventral lobe of the opposite lung. One pea-sized focus in anterior mediastinal lymph gland. Carcass passed.

Cow No. 944.—Holstein grade; 4 years old; 1 calf; raised; appears healthy and in fair condition; weight, 745 pounds.

Postmortem at Fowlers, D. C., March 26, 1901: Cephalic lobe of left lung shows one tubercular focus, size of a pea, in a caseous condition. Left bronchial lymph gland contains a small focus in the semicalcareous stage. Other organs apparently normal. Carcass passed.

It is shown by the postmortem notes above that the lesions manifested at the autopsy were not excessive nor of a chronic nature, which would further indicate that the record of the tuberculin test for the first injection was correct, and that the cows had been infected subsequent to the first test, or that they were even then infected, but without the bacilli being in sufficient quantity to cause a pyrexia in consequence of the tuberculin. The only cow in which the disease was in any way extensive was No. 373, and, as this animal was not slaughtered until four months after the second test and ten months after the first injection, ample time had elapsed to account for the extent of the infection even after the second test.

The third tuberculin injection was made three months later, and of the 18 cows tested not a single one showed a rise of temperature.[a] Shortly after this the superintendent of the Insane Asylum placed a competent veterinarian in charge of the cattle, and it will be of interest to know the results of the methods thus far pursued for the complete extermination and suppression of tuberculosis in this herd.

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[a] Owing to these temperatures being normal, it was not deemed essential to record them here.

The tuberculous animals having been slaughtered, a new herd was started by the purchase of thrifty and vigorous grade cattle that successfully passed the tuberculin test. These cows are at present occupying the barns after thorough disinfection, a complete renovation of the premises, and with improved ventilation and hygienic surroundings in general. Thus having removed, so far as possible, the tubercle bacilli themselves and also their source, it remains to be seen what effect these sanitary measures will have upon the prevention of tuberculosis in the present apparently healthy herd. It has been repeatedly demonstrated in a practical manner that tuberculosis can be completely eradicated from an infected herd and the latter subsequently kept free from the disease, which leads to the belief that, in consequence of the methods of sanitation adopted for the herd under consideration and by occasional tuberculin tests, together with the purchase of only tuberculinized cattle, similar results may be attained in this instance.

SUMMARY OF RESULTS OF TUBERCULIN TESTS.

The result of the first tuberculin test of 102 cows shows a decisive reaction in 76 animals with 1 cow giving a suspicious rise. The second test gave 8 typical reactions out of 26 cattle injected. The third test demonstrated that the 18 cows tested were without the slightest suspicion of tuberculosis. Thus out of 146 individual injections but 1 reaction (cow No. 953) was considered questionable, and, as before mentioned, the postmortem on this animal indicated that the cause of the uncertain rise was probably occasioned either by the minute size of the lesions or the tendency toward encapsulation or both. It seems apparent from the results of the postmortem held on the 8 cows which reacted to the second test that these animals were either not diseased at the time of the first test or, if so, to such a slight degree as to render detection impossible by any known means. In no case where an animal reacted to the tuberculin test did the postmortem fail to show that the cause for the reaction had been tuberculosis. The remaining 18 nonreacting cows are in good thrifty condition, and may be presumed to be healthy after passing three tuberculin tests without giving the least suspicion of a rise in temperature. The length of the period between the injection of the tuberculin and the following reaction varies from eight to eighteen hours, and cow No. 70 is an excellent example of an animal that might be passed as sound if the subsequent temperatures are not followed for at least eighteen hours after the injection. Finally the results obtained from the test of these cows support the good reputation which tuberculin merits as a diagnostic agent.

CONCLUSIONS.

From the results of the experiments conducted in this laboratory, as well as from the majority of similar investigations quoted in this article, the following conclusions regarding the infectiousness of milk from tuberculous cows seem justifiable:

1. The tubercle bacillus may be demonstrated in milk from tuberculous cows when the udders show no perceptible evidence of disease, either macroscopically or microscopically.
2. The bacillus of tuberculosis may be excreted from such an udder in sufficient numbers to produce infection in experimental animals both by ingestion and inoculation.
3. That in cows suffering from tuberculosis the udder may, therefore, become affected at any moment.
4. The presence of the tubercle bacillus in the milk of tuberculous cows is not constant, but varies from day to day.
5. Cows secreting virulent milk may be affected with tuberculosis to a degree that can be detected only by the tuberculin test.
6. The physical examination or general appearance of the animal can not foretell the infectiveness of the milk.
7. The milk of all cows which have reacted to the tuberculin test should be considered as suspicious, and should be subjected to sterilization before using.
8. Still better, tuberculous cows should not be used for general dairy purposes.

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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY—BULLETIN NO. 45.
D. E. SALMON, D. V. M., Chief of Bureau.

TAKOSIS, A CONTAGIOUS DISEASE OF GOATS.

A PRELIMINARY REPORT ON ITS NATURE, CAUSE, AND PREVENTION.

BY

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Animal Industry,
Washington, D. C., March 2, 1903.

Sir: I have the honor to submit herewith a manuscript on "Takosis, a contagious disease of goats: A preliminary report on its nature, cause, and prevention," by Dr. John R. Mohler and Dr. Henry J. Washburn, chief and acting assistant chief, respectively, of the Pathological Division of this Bureau.

During the fall and winter of the past year reports of a chronic, highly fatal disease, which seemed to threaten the Angora goat industry in certain districts, reached the Bureau from several different States; and as the symptoms and postmortem lesions were entirely unlike any of those accompanying the known diseases which affect this species of animals, it was decided to investigate thoroughly the nature of the disease in question and, if possible, to determine the cause of the affection. Laboratory work soon resulted in bringing to light a micrococcus (*Micrococcus caprinus*) in the blood of the heart, lungs, and spleen, which experiments proved to be the cause of the disease. Filtrates were made and a series of experiments undertaken with the purpose in view of securing a preventive, and possibly a cure, of the disease. The paper submitted herewith shows that these efforts met with some success. The work so far done is fully described in this paper, and suggestions for preventing the disease are offered. It is believed that all this will be useful to the industry which has so recently received such widespread attention, and I therefore recommend the publication of this manuscript as Bulletin No. 45 of this Bureau.

Respectfully,

D. E. Salmon, *Chief of Bureau.*

Hon. James Wilson, *Secretary.*

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TAKOSIS, A CONTAGIOUS DISEASE OF GOATS: A PRELIMINARY REPORT ON ITS NATURE, CAUSE, AND PREVENTION.

By John R. Mohler, V. M. D.,
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PRELIMINARY REMARKS.

It will surprise many readers to learn that there exists a disease of any kind sufficiently virulent to kill a goat. As popularly regarded, this animal haunts the backyards and alleys in the suburban districts of our cities, where he picks up various articles of sustenance which would prove fatal if consumed by any other species of animal. Kept under these conditions, he usually presents such a cheerful and healthy appearance that he would at once be pronounced able to combat successfully anything that should come his way, even an infectious disease.

While admitting that the common goat (*Capra hircus*) is susceptible to comparatively few ailments, it will be shown by the following article that the Angora, after many generations of careful breeding and selection under favorable conditions, has developed a perceptible retrogradation in vitality and power of resistance against disease and has been seriously and fatally affected in many sections of the country by a disease not accredited to its prototype. During the fall and winter of the past year, reports of a chronic, highly fatal contagious disease, which seemed to threaten the Angora goat industry in certain districts, reached this Bureau from several different States; and, as the symptoms and postmortem lesions described in the letters were entirely unlike any of those accompanying the known diseases which affect this species of animals, arrangements were made to secure the viscera of an animal that had died after showing characteristic symptoms of the disease in question, in order to investigate the nature, and, if possible, the cause of the affection. As a result, the entire viscera, including the head and intestinal canal of a goat that succumbed to the disease, was received in good condition from Pennsylvania during December, 1901.

The inoculated culture media and cover-glass preparations made from the heart's blood, lungs, and spleen showed a small micrococcus arranged in the form of a diplococcus, and occasionally in tetrads or short chains. Two other organisms were obtained from the liver and lungs—one a large spore-bearing rod and the other a motile, peptonizing bacillus; but, after a bacteriological examination and inoculation tests, they were shown to be obvious contaminations, the result of postmortem invasion. A similar study of the micrococcus isolated from the heart's blood revealed its pathogenic properties to mice and guinea pigs, and it was thereupon determined to make a more extended investigation of the disease. Shortly after, one of the writers was enabled to visit a large flock of Angora goats, among which the disease was prevalent, with deaths occurring daily, and it is principally from the information acquired from an investigation of the disease in this outbreak that the following article has been prepared.

NAME OF DISEASE.

Takosis.—It is with considerable hesitation that a specific designation for the disease in question is suggested at this time, and although generally the coinage of names is to be avoided, still it seems essential and preeminently of importance to individualize this affection by means of a descriptive term. For this purpose the name Takosis is proposed. It is derived from the Greek *τήκω*, meaning to waste, to cause to waste away, and is thought sufficiently descriptive and accurate to meet the desired requirements.

HISTORY OF OUTBREAK.

On arriving at the farm where the Angora goats were kept, it was learned from the owner that goats had been maintained on the premises for several years, but the majority of the flock had been purchased in Texas six weeks before the outbreak. The disease had commenced its ravages in November, when the animals had been on brush land in the mountains. Laurel poisoning was suspected, as several goats had died from this cause during the previous summer, but on closer observation this opinion was disregarded, not only on account of the different symptoms manifested, but also from the chronic course of the disease. The general weakness, loss of flesh, and extreme debility of the animals then suggested intestinal parasites as the cause, and worm powders were administered for a period sufficiently long to obtain results but without success. It was then thought desirable to change the pasture, and accordingly the goats were brought down from the mountains to the farm, where they were stable-fed. The majority were placed on the ground floor of a large hillside barn in various-sized pens to accommodate the several bunches into which the animals had been graded.

The remainder were allowed the freedom of the yard and hillside and were stabled on the barn floor proper between two haymows. Feeding troughs and mangers had been erected, and this provision was in every way satisfactory for the purpose for which it was designed. The barn, pens, and yards in which the animals were kept appeared to be in good sanitary condition and well adapted to the sheltering of goats. The feed consisted of corn, oats, and hay in ample quantities and in proper proportion, and the goats at all times took readily to this diet, even up to the time of death. In fact, it was a curious circumstance to observe, on postmortem examination of a large proportion of these animals, that the stomachs were filled with recently partaken food. And the goats could be seen eating hay sometimes with evident relish, at other times in a listless manner, when their vitality was so reduced as to make standing impossible. Despite the change from the mountain pasture, including an entire change of surroundings as well as diet, deaths continued with alarming frequency, and the services of the Bureau were solicited in combating the affection.

The continuance of the fatalities after a complete change of diet and shelter, the regularity of the course of the disease, the apparent similarity of the symptoms in all the affected animals as well as the evident spread of the affection from one animal to another, led the owner to be strongly suspicious that he was dealing with a contagious disease, and he therefore constructed a pen in a corner of the basement wherein all the affected goats were placed. This proved to be a step in the right direction, but the disease became so prevalent that an additional pen was brought into service. As no endeavor had been made to separate the latter hospital from the remaining pens, the results were not so beneficial as they might have been had this pen been entirely isolated, as was the original hospital. As it was, the larger unaffected does and bucks were able to hurdle the fence and thus carry the infectious principle back to the healthy goats. This was at once brought to the notice of the owner, and steps were immediately taken to keep the healthy animals out of the infected pen as well as to isolate more thoroughly the inclosed goats by securely boarding up these quarters. This method of segregating the diseased animals, together with the disinfecting measures adopted, probably resulted in confining the ravages of the affection to a minimum.

SYMPTOMS.

The disease presents many of the symptoms usually accompanying a parasitic invasion and is characterized by great emaciation and weakness, with symptoms of diarrhea and pneumonia. In the early stages of the affection there is usually little to indicate that anything is seriously amiss with the animal. The first observable symptom manifested is the listless and languid appearance of the animal, evidenced by its lagging behind the flock, and is usually accompanied by a drooping of the ears and a drowsy appearance of the eyes. The pulse is slow and feeble and the temperature is elevated slightly at first, but becomes subnormal a few days before death. The highest temperature observed in the natural disease was 104.1°, and the lowest, in a prostrated animal a few hours before death, registered 99.7° F. Snuffling of the nose, as in a case of coryza, with occasional coughing is sometimes in evidence.

As the disease advances the animal moves about in a desultory manner, with back arched, neck drawn down toward the sternum, and with a staggering gait. Rumination is seldom impaired. The appetite, while not so vigorous, is still present, though capricious, and the affected animal shows plainly that the ravages of the disease are rapidly overcoming the restorative elements derived from the food. The fleece is usually of good growth and presents a surprisingly thrifty appearance when the condition of the animal is taken into consideration. All the exposed mucous membranes appear pale and the respirations are accelerated and labored. The goats finally become so weak that they are readily knocked down and trampled upon by their fellows. If picked up they may move off slowly and eat a little, but within a few hours are down again, and in this way linger for several days, shrinking to about half their natural weight, and occasionally bleating or groaning, with head bent around on the side or drawn down to the sternum. A fluid discharge from the bowels of a very offensive odor is usually observed in the last few days of life, but this symptom is not constant.

COURSE AND SUSCEPTIBILITY.

This disease may assume a subacute or chronic type, usually the latter. According to our own observations, the animal dies of inanition in from eight days to six or eight weeks. Several owners have reported deaths after only two or three days of illness, but the goats doubtless had been affected for a longer period, although not noticed on account of their mingling in the flock. It is the consensus of opinion among the breeders interviewed that many of the animals succeeded in living for weeks, but gradually became weaker and more debilitated, finally dying in a comatose condition. In no instance have we observed or heard of the natural recovery of an animal after once the symptoms of takosis were noticed.

The younger goats seemed to be the most susceptible to the disease, although the old animals were by no means immune. The does, wethers, and also the bucks became affected, and for a period of almost two months (December and January) newly diseased goats varying in number to as many as 11 were removed to the hospital daily on the

Pennsylvania farm where the disease was investigated. Owing to the preponderance of does at this place, it appeared that the affection was most virulent for them, but this fact has not been sustained by reports subsequently received from other sections.

PATHOLOGICAL ANATOMY.

As already indicated, the general appearance of the carcass simulates that produced by a wasting disease. The visible mucous membranes are pale and anemic, while the fleece, which appears somewhat dry and lusterless, furnishes a shroud for the extremely emaciated condition that becomes plainly perceptible on skinning. This masking quality of the hair prevents an accurate estimate of the condition of the animal by the eye alone, and necessitates handling of the individual to appreciate to the full extent the inroads made by the affection. The same anemic condition of the subcutaneous and muscular tissues is observed on eviscerating the carcasses. The lungs in most cases are the seat of a peculiar diversified inflammation, never of a remarkable extent. The external appearance of these organs is at times mottled, caused by a few congested areas, several patches of an iron-gray color similar to areas of pneumonia during the process of absorption, and normal tissue. On section through the reddened patches, a frothy mucus may exude from the bronchioles, and in one case numerous punctiform hemorrhages were observed on the sides of the incision. This tissue, while not so buoyant as a normal portion would be, nevertheless floats when placed in water.

The heart in all cases is pale and dull, its tissue soft and flabby, while inflamed areas, more or less penetrating, are present at times on the epicardium about the auricular appendages, and at other times on the endocardium, especially that lining the ventricles. These hemorrhagic patches consist of either pure extravasated blood or blood mixed with serum, which gives them a more diffuse appearance and a gelatinous consistence. The pericardium is slightly thickened, and usually contains a small increase of fluid tinged with blood. The liver usually appears normal, although the gall bladder is frequently distended with pale-yellow watery bile. The kidneys are anemic and softened. The cortex appears slightly thicker and paler than normal, and contrasts strongly with the darker pyramids. The capsule strips off easily from the parenchyma of the organ. In one instance several pale areas simulating anemic infarcts were observed under the capsule extending into the cortex, which probably resulted from the compression of the capillaries by the swollen parenchymatous cells. The presence of albumin in the urine was detected by the nitric-acid test. The spleen appears atrophied and indurated, and on section the fibrous tissue far exceeds the splenic pulp. Attachments by fibrous adhesions may fix the spleen to the diaphragm or the neighboring organs. The intestines may contain normal fecal matter or semifluid feces of a disagreeable odor. The surface of the mucous membrane is at times covered with a slimy mucus or plastic exudate, and the appearance is that of a chronic catarrh associated with necrosis of the mucosa. The brain and spinal cord of four cases were examined, but without discovering any apparent alterations. As an illustration of the ravages of this disease, the following brief notes are recorded upon two Angora goats which were sent from the same flock to the laboratory in order that work previously done and facts already established might be confirmed.

The larger of these was a female, one year old, greatly emaciated, and was at no time after its arrival at the laboratory able to stand alone, even when lifted up and placed on its feet. It was still able and willing to eat and drink, but it showed plainly that the ravages of the disease were rapidly getting the best of the reconstructive forces. The fleece was of good length, and appeared more glossy than that naturally found on animals so seriously emaciated. All of its exposed mucous membranes were pale. Temperature subnormal, pulse imperceptible, and heart's action feeble and irregular. Occasional bleating was heard, and the goat seemed in great distress. Because of the helpless condition of this animal it was killed the second day after its arrival, and at the autopsy the following conditions were noted:

Muscular tissue pale and anemic; lymph glands enlarged, but of normal color; the superficial inguinal glands were especially noticeable in regard to this condition. The lungs were affected throughout with a finely diversified pneumonia. There were three small areas (0.5 cm. to 2 cm. in diameter) of complete hepatization irregularly located near the surface of the left lung, while the remaining portions of both lungs were grayish red in color. The pleura showed no lesion. The heart muscle was pale, and directly beneath the epicardium were a number of dark hemorrhagic areas which ranged in size from a pin head to a large bean.

The pericardial sac contained from 250 to 300 c. c. of slightly reddened nonviscid fluid. Liver apparently normal. Spleen shrunken and pale. The kidneys appeared anemic and somewhat flabby. The bladder contained about 30 c. c. of albuminous urine. The small intestines were inflamed and their internal surface was covered, wherever the inflammation existed, with a slimy, malodorous deposit. The stomachs and large intestines were normal, as were also the brain and spinal cord. The general appearance of the affected animal would lead one to suspect a verminous affection of the alimentary tract. The emaciated, anemic condition of the animal, as well as the persistent appetite associated with diarrhea, would strengthen such an opinion. For this reason a careful examination of the stomachs and intestines was made. The only result, however, was the discovery of three specimens of the comparatively harmless *Cysticercus tenuicollis*, which were attached to the external surface of the rumen. There was no trace of animal parasites to be found in the stomachs, intestines, or other organs.

Cultures made from the heart, lungs, spleen, liver, and mediastinal lymph gland proved positive, and in most of these instances the micrococcus was grown at once in pure culture.

The smaller of the two goats received at the laboratory during the latter part of March was a wether about one year of age. It was much emaciated but still active on its arrival. Its appetite was unimpaired. Physical examination made on the day previous to its death showed a temperature of 102.5° F.; respiration, 32; pulse, 112, irregular and somewhat fluttering. The exposed mucous membranes were pale and the eyes dull and lusterless.

This animal died on the third day after its arrival at the laboratory. At the postmortem examination there was found to be general emaciation of the muscular tissues, which appeared whitened and bloodless. About 200 c. c. of fluid was present in the pericardial sac. It was reddish, thin, and appeared like greatly diluted blood. The lungs floated in water, but presented the same grayish red appearance that has already been noted in the lungs of its mate. The spleen was small, pale, and firm. The kidneys appeared swollen and anemic. The bladder was empty. The liver showed no lesions. The mucosa of the abomasum was slightly congested. The intestines were empty throughout, and appeared but moderately inflamed in the region of the duodenum and jejenum. The rumen contained a large quantity of undigested food and was in a normal condition. The brain and spinal cord presented an equally healthful appearance. Search for animal parasites was without result, although the visceral organs were carefully scrutinized.

Positive cultures were obtained from the pericardial and peritoneal fluids and from the liver and lungs.

BACTERIOLOGY.

During the visit to the affected flock, several goats were slaughtered in various stages of the disease and tubes of agar media (on account of their ease of transportation) were inoculated from the various organs and heart's blood as well as cover-glass preparations obtained from the juices of these tissues. Subsequent examination of the cultures and slides showed the presence of a micrococcus, usually arranged in the form of a diplococcus, which was found to be in pure cultures from the heart's blood, spleen, kidneys, and pericardial fluid, and essentially so in the tubes inoculated from the other organs. Inoculations made from the spinal cord were negative. Identical organisms have since been obtained from Angora goats affected with the disease from several different localities and their identity proved by cultural examination and inoculation tests. Various other micrococci to which the one under consideration bears a resemblance were carefully compared, but we have not been able to identify the latter with any of the previously described organisms, although it presents in a parallel series of cultures many characteristics in common with the *Staphylococcus pyogenes albus*. Owing to the scarcity of any preeminently conspicuous lesion in the affected goats, and to the absence of any typical morphologic or cultural characteristic of the micrococcus, it was thought desirable to derive its name from its host, especially as it did not appear to be pathogenic for pigs, dogs, and chickens which fed upon the diseased carcasses on one of the infected premises, or for horses, cattle, and sheep that were quartered in an adjoining portion of the same stable. Therefore the name *Micrococcus caprinus* sp. nov. is suggested.

MORPHOLOGY.

The specific organism of takosis appears in fresh bouillon cultures as a spherical or oval micrococcus with a diameter of 0.8 to 1 μ. In these cultures it is single or in chains of two, three, or four elements, but most frequently in pairs, as diplococci (Pl. I, fig. 1), with a diameter transverse to the axis of the chain greater than the longitudinal diameter. There is quite a variation in the size of the cocci, probably due to the increase in the size of the organism preparatory to the act of fission. As the cultures become older the cocci develop a stronger tendency to form chains, and after remaining in the incubator at 37° C. for three or more days chains of four to six elements are at times observed, as are also irregular clumps of cells which collect in masses of varying sizes. When they assume this grouping tendency no oval forms are to be found and each of the organisms is strictly spherical in outline. In the tissues they are frequently seen to deviate from the spherical and assume somewhat of a lancet shape, with the pointed extremities in apposition. This same form has been met in samples of blood freshly drawn from the ear of an affected goat. The elements forming pairs are frequently very unequal in size and are not always of uniform shape. (Pl. II, fig. 1.) They are seen to possess the ability of executing strong Brownian movements, but make no progress across the field of the microscope. No capsule has been observed surrounding these micrococci either in the blood or when obtained from cultures, nor have spores, vacuoles, or crystals been seen. The organism stains indistinctly and with difficulty with Loeffler's methylene blue and the standard aqueous aniline dyes, with the exception of gentian violet, but carbol-fuchsin and Gram's and Gram-Weigert's stains give clear uniform coloration to the cells.

BIOLOGY.

The organism develops as an aerobe, but it also supports an active growth when deprived of oxygen, and is, therefore, a facultative anaerobe. It grows both on solid and in liquid culture media with the usual degree of alkalinity, but also multiplies in those that give an acid reaction of +1.5 phenolphthalein.

A temperature of 37° C. is most favorable for its development, but it will also grow at room temperature. In the latter case the growth is more tardy and not so profuse.

CULTURAL CHARACTERISTICS.—*Bouillon.*—In neutral (phenolphthalein) peptonized beef broth a slight uniform cloudiness is caused by the growth of the organism within ten hours at 37° C. This condition increases until, after twenty-four hours at the above temperature, the cloudiness has become quite marked and uniform. At this time a deposit may be noticed beginning to gather on the bottom of the tube. In three days this sediment has increased in volume and the turbidity of the supernatant fluid has been lost. The deposit is pearl gray in color, and on agitating the tube it rises slowly in the shape of a twisted, ropy, coherent mass. A delicate marginal ring on the side of the tube is usually produced. No pellicle is formed nor can any characteristic odor be detected. The reaction of bouillon in which this organism has been growing for five days becomes decidedly acid, +1.7 phenolphthalein, and continues to increase in acidity subsequently.

Agar.—Growth upon the surface of slant agar occurs in twenty-four hours in the form of a white, glistening granular streak composed of numerous confluent colonies. This narrow line of growth becomes more extensive and reaches its maximum width on the third or fourth day, when it shows a ceraceous, at times granular, surface, with irregular wavy margins. In stab cultures the growth appears within 24 hours as profuse, small, grayish white, closely aggregated globules, so densely packed together as to give an irregular nodulose appearance macroscopically along the entire length of the line of puncture. The only colony which develops at the point of entrance of the needle is at first pearly white, but after twenty-four hours it assumes a grayish color in the center, with a lighter periphery of an equal breadth. It has a slightly granular center, a regular border, and is from 8 to 10 mm. in diameter. The surface growth on agar plates appears as smooth white, flatly convex, ceraceous colonies, about 1.5 mm. in diameter, with entire borders. By reflected light these surface colonies appear homogeneous, but, observed by transmitted light, they present a white center and pearly margin. The submerged colonies develop as light brownish foci with regular outlines. They may be round or lentil shaped, but are always minute in size. No characteristic differences in growth of this organism have been observed when sown on glycerin-agar or on serum-gelatin-agar.

Gelatin.—In this medium the growth is slower, evidence of fertility not appearing until forty-eight hours. In stab cultures the line of puncture is occupied by numerous nodulose milk-white colonies that have apparently coalesced, and which extend to the extreme end of the track. When examined by the aid of the hand lens, they appear as closely aggregated individual colonies, with regular outlines and presenting a beaded appearance. These colonies are more minute than in agar, and the growth that appears on the surface, though similar in consistence, is likewise thinner and less profuse than parallel agar colonies. The organism will not liquefy gelatin until several generations have been grown upon artificial media. After a number of subinoculations the peptonizing of the gelatin commences on the seventh or eighth day, and later as early as the fourth or fifth day, when the surface growth is seen to sink, following which liquefaction is very rapid, and may reach the bottom of the tube in forty-eight hours, leaving a funnel-like track in its wake. The adjoining medium is then attacked, and within ten days after inoculation the contents become fluid, with a white pellicle on the surface. The appearance of the gelatin-plate colonies which develop on the second or third day is probably of a more milk-white color, and thinner and slightly smaller than those in agar, but otherwise are similar. Liquefaction does not commence until the fourth or fifth day, sometimes the seventh day, and this occurs only after continued subinoculations.

Blood serum.—The organism grows steadily on coagulated blood serum. The colonies coalesce, forming a narrow, compact line of whitish color, with edges slightly elevated above the level of the body of the growth. The water of condensation at the base of the serum slant is clouded and contains a white sediment. As the cultures become older, or after seven or eight days' growth, they assume a brownish color. In this work the serum used was obtained from the blood of a dog and was freshly prepared immediately preceding its use.

Potato.—When a loopful of a vigorous bouillon culture is sown upon the surface of potato, the growth that ensues along the line of inoculation inside of thirty-six hours is slight, moist, and glistening. In forty-eight hours it appears granular and rather feeble, like a cluster of dewdrops. Growth ceases by the third day, at which time the granular surface, with the aid of the hand lens, appears to be made up of minute individual raised colonies of a ceraceous nature that have become confluent.

Milk.—Growth develops rapidly when tubes of this medium are inoculated, but the only manifestation of the development during the first twenty-four hours is a slight deposit observed at the bottom of the tube. No change occurs in the appearance of the milk until the

DESCRIPTION OF PLATE I.

FIG. 1. Twenty-four-hours'-old bouillon culture of *Micrococcus caprinus* stained with gentian violet. Camera lucida drawing made at stage level with Zeiss No. 4 compensating ocular and 2 mm. oil immersion.

FIG. 2. Forty-eight-hours'-old milk culture stained with gentian violet. Camera lucida drawing made at stage level with Zeiss No. 4 compensating ocular and 2 mm. oil immersion.

DESCRIPTION OF PLATE II.

FIG. 1. Cover-glass preparation from lung of goat No. 2, dead as a result of natural infection. Stained with gentian violet. Camera lucida drawing made at stage level with Zeiss No. 4 compensating ocular and 2 mm. oil immersion.

FIG. 2. Cover-glass preparation of blood from posterior auricular vein of Angora goat No. 23, removed aseptically seven days before death from takosis. Stained by Gram's method, followed with eosin. Drawing with camera lucida at stage level with No. 6 compensating ocular and 2 mm. oil immersion and increased six diameters.

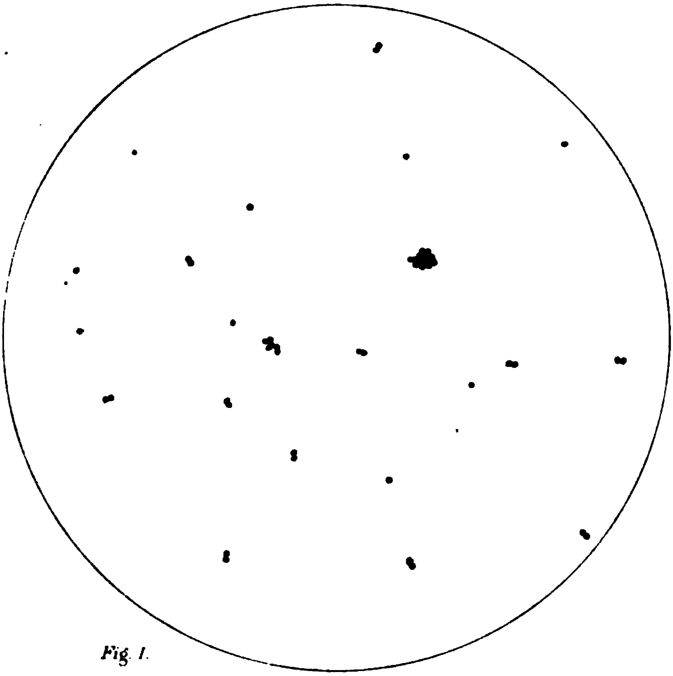

Fig. I.

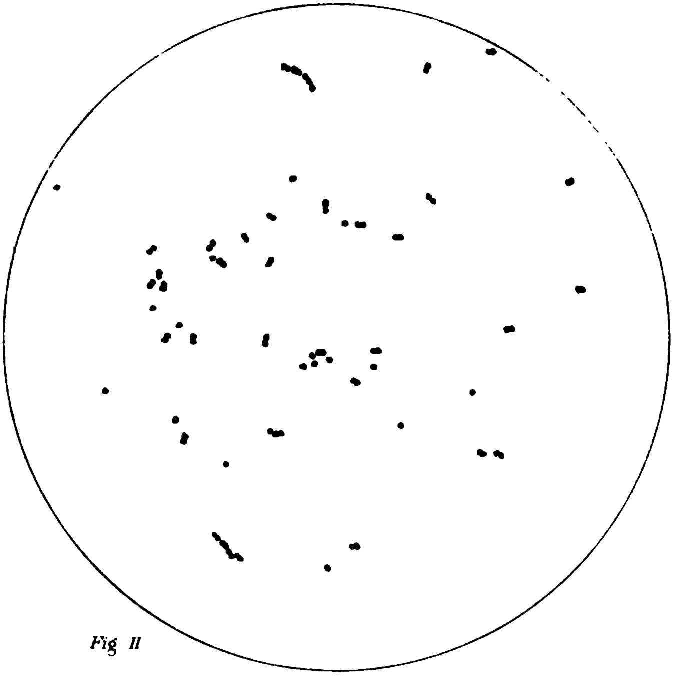

Fig II

Haines, del.

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MICROCOCCUS CAPRINUS FROM
(1) BOUILLON AND (2) MILK CULTURE MEDIA

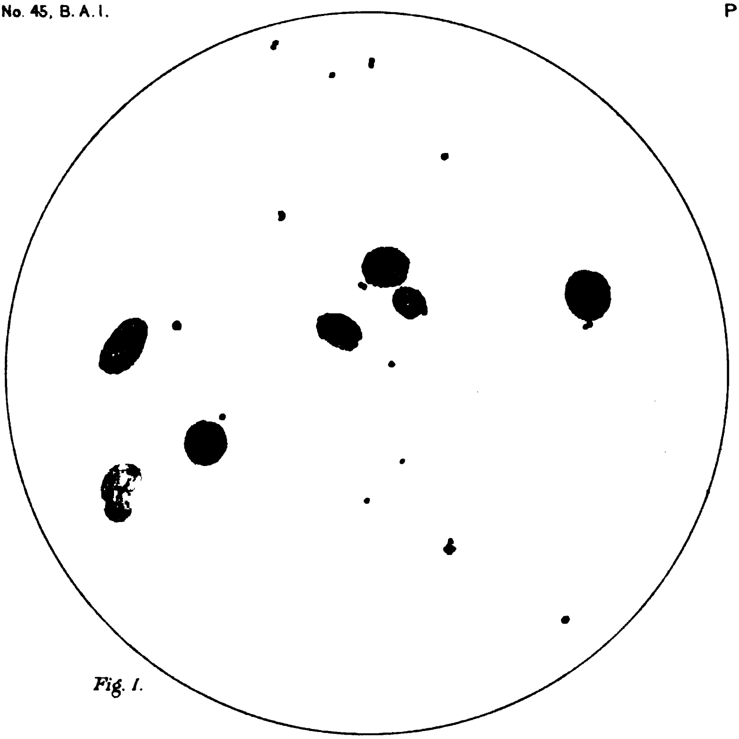

Fig. I.

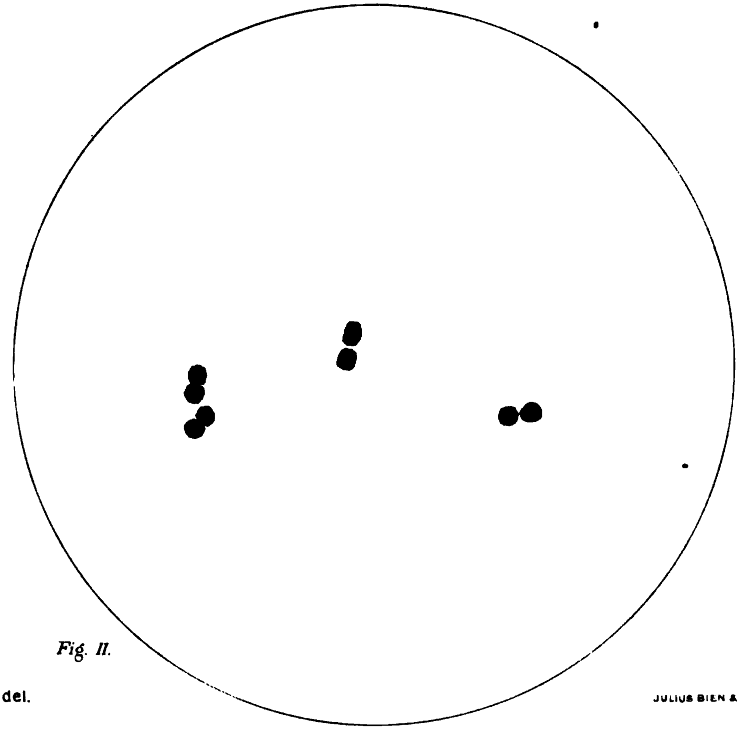

Fig. II.

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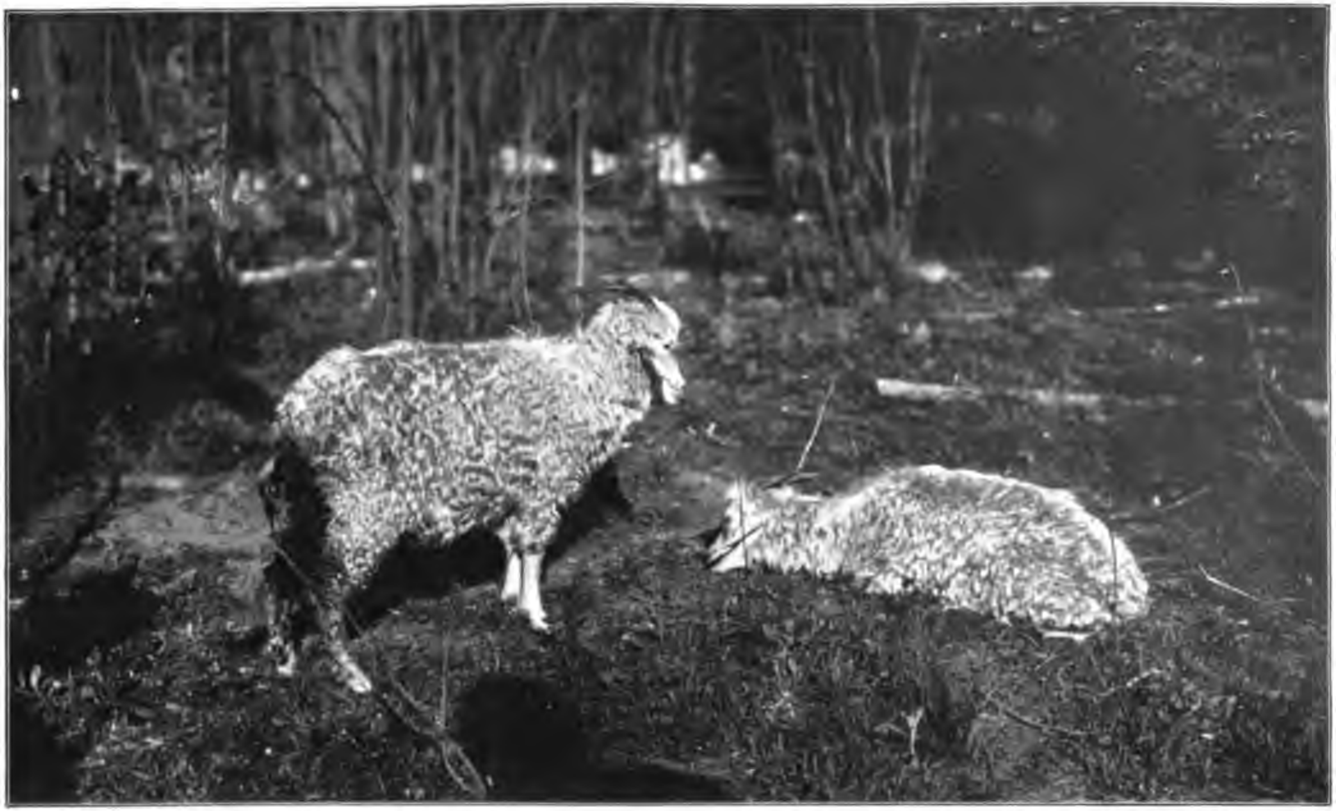
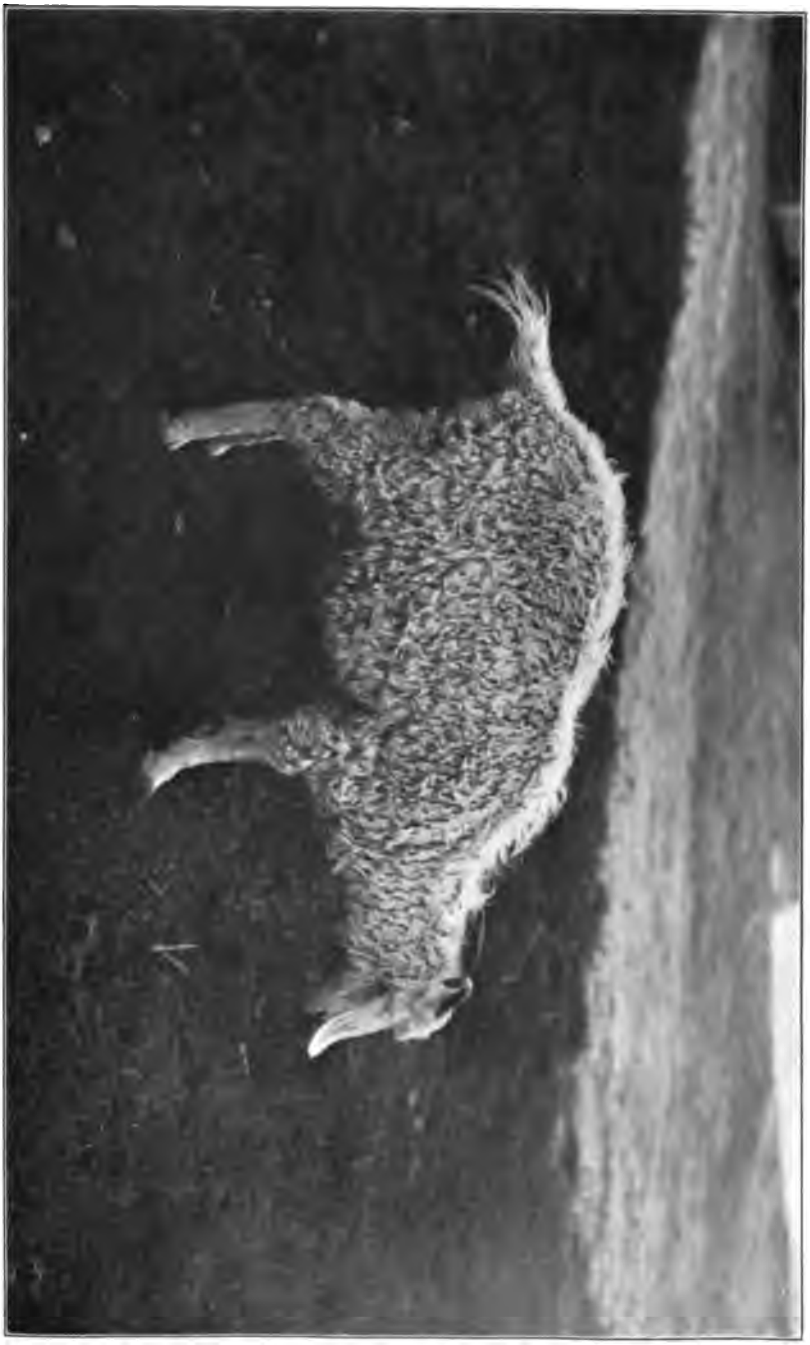
MICROCOCCUS CAPRINUS FROM THE
(1) LUNG AND (2) BLOOD OF ANGORA GOATS



ANGORA GOATS NOS. 31 AND 32 AFFECTED WITH TAKOSIS; PHOTOGRAPHED 24 HOURS BEFORE DEATH.



ANGORA GOAT NO. 27, SIX DAYS BEFORE DEATH FROM TAKOSIS.

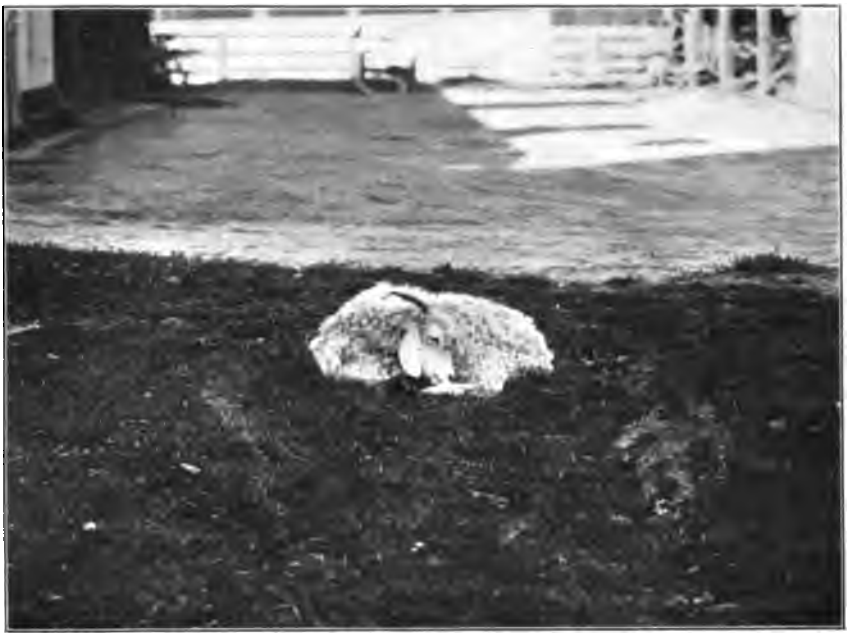


FIG. 1.—ANGORA GOAT FROM MARYLAND FLOCK; PHOTOGRAPHED THREE DAYS BEFORE DEATH.

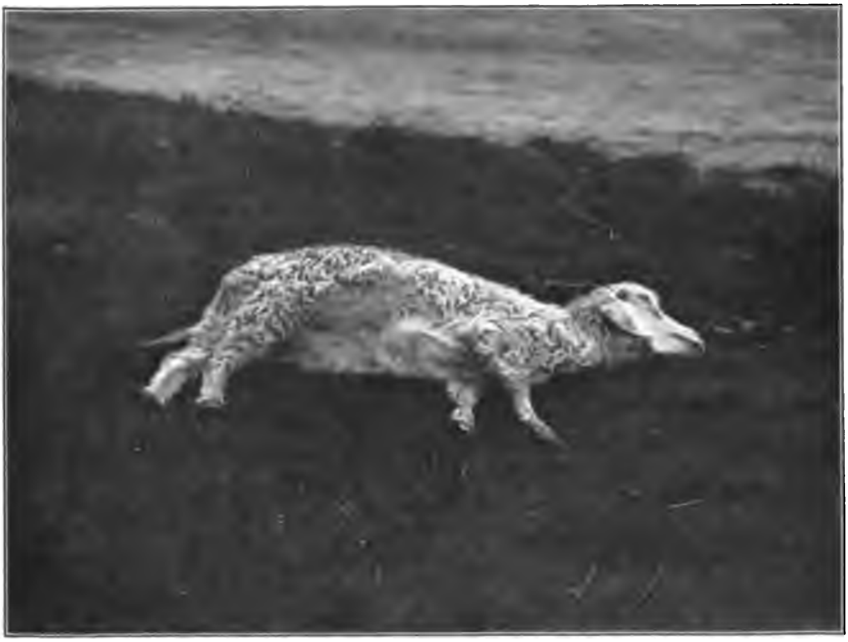


FIG. 2.—SAME AS FIG. 1. POSITION ASSUMED AFTER EXHAUSTIVE EFFORTS TO REGAIN ITS FEET.

third or fourth day, when the medium becomes firmly coagulated in one mass. Within the following twenty-four hours the coagulum becomes partially peptonized and a transparent odorless whey is collected at one side of the slightly inclined tube, or at the top, if the tube is kept in a vertical position. This separation has been observed in various instances to commence from the fourth to the eighth day, and is usually completed after twenty-four to thirty-six hours, at which time the solid curd takes up from one-third to one-half of the volume of the medium, and either adheres to one side or occupies the bottom of the tube.

Litmus milk is changed to a delicate pink on the third day, owing to the development of acids, but no coagulum occurs until the fourth or fifth day, when a similar separation of the curd and whey takes place, as in plain milk with a greater tendency of the coagulum to form flocculi.

Fermentative action.[a]—The growth in bouillon, to which 1 per cent lactose, dextrose, and saccharose has been added, is rapid, especially with saccharose, but without any formation of gas. Inside of twenty-four hours the bulb becomes uniformly turbid in all these fluids, with a slight sediment in the branch and the appearance of growth at the extreme bottom of the closed tube. A faint marginal ring, but no pellicle, is observed. After three or four days the closed branch is uniformly clouded throughout, and remains so until the partial gravitation of the suspended elements, which occurs in six or seven days. Lactose bouillon cultures develop 5.1 per cent acid in growing for five days at 37° C., while dextrose cultures produce 3.9 per cent and saccharose bouillon cultures 3.5 per cent acid in the same time and under the same conditions. In sixteen days these media gave, respectively, a reaction of 7.7 per cent, 5.5 per cent, and 10.1 per cent. After thirty days' development the production of acid in lactose, according to the phenolphthalein test, was 9.2 per cent, dextrose 6.2 per cent, and saccharose 11.8 per cent. The production of acids is constant in all media.

Indol.—Cultures that have grown in Dunham's solution for two, seven, ten, and thirty days, respectively, were tested for the presence of indol by the method of Kitasato. In each case the result was negative.

Phenol.—Bouillon cultures of ten days' development, when submitted to Weyl-Lewandowski's test for phenol, threw down a precipitate of fine crystals which by microscopic examination proved to be phenol. The distillate failed to show the reaction for indol.

Thermal death point.—Tubes containing 1 c. c. each of bouillon cultures of a twenty-four hours' growth were exposed to a temperature of 50° C. for varying periods of time, and fresh tubes of bouillon inoculated from them immediately afterwards. By this means it was shown that the tube which remained in the bath for three hours and fifteen minutes produced growth, although it was slight and tardy and the germ was evidently attenuated, while all that were exposed for three hours and twenty minutes or longer remained sterile. At 58° C. growth fails to occur after an exposure of only ten minutes. At 62° C. the organism was killed in six minutes, while it resisted a temperature of 70° C. for three minutes.

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[a] The titre of these media was 1 phenolphthalein.

Desiccation.—The results obtained by the desiccation of the germ for twelve hours in the incubator at 37° C., with its subsequent exposure to the diffuse light of the room for a period of nine days, were sufficient to prove that sterility is thus produced.

Temperature requirements.—As previously mentioned, this micrococcus develops profusely at incubator temperature, while at 20° to 22° C. the growth is more tardy and less profuse. The maximum temperature at which the organism would multiply was found to be between 45° and 46° C. No growth developed at 47° C.

Effect of low temperature.—Tubes that were placed in a freezing mixture twice daily and kept in the ice chest under these conditions for four days were subsequently incubated at 37° C., with the result that they became fertile in every instance.

Action of disinfectants.—When the organism was subjected for twenty-six minutes to a 1–2,000 solution of bichloride of mercury, no growth followed, but an exposure to a 1–1,000 solution proved fatal in thirty seconds. A 1 per cent solution of carbolic acid sufficed to prevent development only after an exposure of fifty-seven minutes, while a 2.5 per cent solution caused the death of the micrococcus in thirty seconds. Formalin, in the strength of a 2 per cent solution, required an exposure of thirty-one minutes to prevent the subsequent development of the organism. These disinfecting solutions were all used at room temperature (about 21° C.).

PATHOGENESIS.

In order to demonstrate the pathogenic properties of the *Micrococcus caprinus* and to establish its etiological significance in the disease in question, the following inoculation experiments were conducted upon white mice, white and brown rats, guinea pigs, rabbits, chickens, dogs, sheep, and goats.

EXPERIMENTS WITH MICE.

Subcutaneous.—On January 11 a white mouse was inoculated intramuscularly near the base of the tail with 0.1 c. c. of an original bouillon culture from the spleen of Angora goat No. 2. In a few days it became languid and soon developed a diarrhea which terminated in death on the twelfth day. The postmortem showed the small intestines to be greatly darkened and inflamed. The lungs presented localized areas of congestion. The kidneys were enlarged and anemic and the spleen dark and swollen. The specific organism was recovered in pure culture from the lungs, heart, and spleen.

Intraabdominal.—The second mouse was inoculated intraabdominally on July 30 with 0.1 c. c. of a culture (sixth generation) which had been originally obtained from the lung of guinea pig No. 798 on February 2 and had been subjected in the meantime to repeated transplanting on slant agar. On August 2 the mouse was dull and stupid, with hair ruffled, and it remained crouching under the cotton in its cage the entire day. These conditions were very manifest on the following day, and on August 4 purging was established, which also continued on the 5th. The mouse was very languid and quiet on August 6 and 7, and died on August 8, nine days after the inoculation.

On postmortem the heart, liver, and lungs appeared normal. The intestines were inflamed and empty. The spleen was light in color and somewhat swollen. The glands of the lymphatic system, especially those of the throat and neck, were enlarged and congested.

Ingestion.—Mouse No. 3 was fed for four days, beginning July 30, upon bread that had been moistened with 8 c. c. of a bouillon culture of the same description as that used in the preceding test. On August 7 the mouse began purging, which continued until August 9, when it died. The autopsy showed that the lesions were confined to the digestive organs, the heart and lungs appearing normal. Cultures of the micrococcus were recovered from the heart, liver, and kidneys of the two last-mentioned mice.

EXPERIMENTS ON RATS.

Both the white and brown rats appear to be totally immune, although submitted to subcutaneous and intraabdominal inoculations with 0.5 c. c. of fresh virulent cultures. They evinced no apparent disturbance of any of their organic functions.

Feeding experiments were likewise accompanied with negative results.

EXPERIMENTS ON GUINEA PIGS.

Guinea pigs have proved susceptible in every inoculatory case, and the course of the disease evinced by these animals is very typical. They show gradual emaciation and wasting, with symptoms of pneumonia appearing a few days previous to death. Numerous cases developed enteritis with its consequent purging, but this condition was by no means constant. Convulsions, which so frequently attack rabbits during the latter stage of this disease, were not at any time observed in the guinea pig. The peculiar form of pneumonia already noted as appearing in the goat is seen to affect the guinea pig with great regularity. The organism was readily recovered from the heart, lungs, liver, kidneys, and spleen; in fact, it was found to be distributed throughout the blood of the circulation. Examinations of the flocculent sediment occasionally found in the urine resulted negatively.

A few typical cases of the disease in guinea pigs as a result of various forms of inoculation may be briefly given as follows:

Subcutaneous.—On January 3 guinea pig No. 707 received subcutaneously 0.25 c. c. of a bouillon culture of twenty-four hours' growth from the spleen of goat No. 2. The animal soon began to give evidence of an insidious disturbance of its nutrition, which continued until January 26, when it died, having in the meantime gradually reached a condition of extreme emaciation. The organism was recovered from the lungs, heart, spleen, and mesenteric glands. The period of life following the subcutaneous inoculation of doses ranging from 0.25 to 0.5 c. c. varied from sixteen to twenty-three days, and averaged twenty and one-half days.

Intramuscular.—On January 3 guinea pig No. 710 received 0.25 c. c. of the same culture used in the test with No. 707, injected intramuscularly. Eight days later, or on January 11, the animal died.

Postmortem examination showed the carcass seriously emaciated. Liver and spleen enlarged, lungs congested, and the kidneys pale and softened.

Intramuscular inoculations of from 0.25 c. c. to 0.75 c. c. of a twenty-four hour bouillon culture resulted in the death of the guinea pigs in from eight to thirteen days, with an average of nine days.

Intraabdominal.—Guinea pig No. 801 was inoculated intraabdominally on January 20 with 0.75 c. c. of a bouillon culture from the spleen of goat No. 2. Nine days later the animal died and the postmortem examination disclosed the usual picture of a wasted carcass, occluded lungs, inflamed intestines, fatty degeneration of the liver, and anemic kidneys. The average period of life following an injection of 0.25 to 0.75 c. c. by this method was twelve days, although death occurred in some cases as early as the eighth and as late as the twentieth day.

Ingestion.—After being deprived of food for twenty-four hours, guinea pigs Nos. 1413 and 1417 were fed 40 c. c. of a twenty-four-hour bouillon culture soaked in bread crumbs. No deleterious results were observed as a result of this feeding experiment.

EXPERIMENTS ON RABBITS.

These animals possessed a certain degree of immunity, many of those used in the various tests remaining unaffected. Those that became ill showed a marked rise of temperature, which diminished slowly after reaching its crisis, and for twenty-four hours preceding death was subnormal. Diarrhea and wasting uniformly appeared, and the subject frequently died in convulsions or tetanic spasms.

Intraabdominal.—The intraabdominal inoculation of 1 c. c. of a bouillon culture produced death in twenty-five days. The postmortem examination showed the lungs to be normal, the heart pale and flabby, liver enlarged and hyperemic, with gall bladder greatly distended. Spleen shrunken and showed excess of fibrous tissue. Intestines contained much gas and a small amount of fluid ingesta. The mucosa of the small intestines presented a catarrhal inflammation. Pure cultures were obtained from these affected organs.

Intratracheal.—Rabbits Nos. 382 and 383 were injected intratracheally with 1.5 and 1 c. c. of a bouillon culture, which resulted in death on the twenty-ninth and twenty-second day, respectively. Rabbits Nos. 381 and 472, each receiving 0.5 c. c., remained unaffected. The postmortem examination of No. 382 showed the mucous membrane of the trachea to be inflamed in patches, especially along the anterior portion. Both lungs were hepatized in numerous localized areas. Heart flabby, liver dark, and gall bladder filled with watery bile. Spleen indurated and reduced in size. Intestines catarrhal and empty. Bladder distended with albuminous urine.

On postmortem examination of rabbit No. 383 the hide was found to be very tightly attached to the subcutaneous tissue and extremely dry. The pharynx and trachea were inflamed throughout. Cephalic lobes of both lungs hepatized. The auricles were distended and the heart muscle pale. Spleen shrunken. Kidneys dry and flabby. Liver dark in color, with distended gall bladder. Intestinal contents fluid.

Culture media inoculations were positive in both the above cases.

Intravenous.—Rabbit No. 219 was inoculated intravenously on January 3 with 0.5 c. c. of bouillon culture from spleen of goat No. 2. It remained unaffected.

On January 15 rabbit No. 233 received 1 c. c. of the second generation of a bouillon culture obtained from the spleen of goat No. 2. On January 23 it refused to eat and on the following day it died in tetanic spasms. Microscopic and cultural examinations demonstrated the presence of the *Micrococcus caprinus* in the heart, lungs, and liver.

Ingestion.—After twenty-four hours' abstinence from food, rabbit No. 728 received the organism mixed in its food for two consecutive days, commencing on April 17. The animal remained unaffected for a period of three months, at which time it was withdrawn from the experiment.

Rabbit No. 296 was subjected to the same feeding test on April 17. On May 7 the rabbit seemed partially paralyzed in hind limbs; had fallen away greatly in flesh, and was a mere skeleton. May 8, hind limbs fully paralyzed. May 11, died after a period of twenty-five days.

Postmortem examination showed the animal to be very anemic and emaciated. Lungs appeared reddened and filled with blood. Heart normal. Liver enlarged and greatly darkened with the gall bladder distended with bile. Spleen showed an apparent atrophy and dryness of the splenic pulp. Kidneys of normal size but pale in color. Bladder greatly distended and filled with albuminous urine. It was attached at its fundus to the cecum by frail bands of fibrous tissue. The ileum was likewise adherent to the parietal peritoneum and to the liver. The stomach contained normal food, but its mucosa was covered with a thick glutinous mucus. The stomach wall appeared tender and was readily torn. Its pyloric end and the beginning of the duodenum was greatly thickened and the mucosa inflamed and convoluted. Inflammatory mucus could also be observed throughout the entire extent of the small intestines. Cover-glass preparations from the juices of the liver and lungs showed the presence of the specific organism.

EXPERIMENTS WITH CHICKENS.

The inoculation of fowls proved that the micrococcus possessed purgative properties for these birds, but in no case was the result fatal.

Intravenous injections of 1 c. c. and subcutaneous inoculations of 3 c. c. were made on four chickens, with uniform results. On the day following the inoculation the fowls become dull and listless. On the second day they refuse their food and are affected with diarrhea, which may persist for forty-eight hours, but in no case under our observation did it last longer. Recovery of normal condition is rapid after cessation of the purging.

It may also be mentioned at this time that the carcasses of the goats having died of takosis on a Pennsylvania farm were fed by the owner to his chickens and swine, but in neither case was any unfavorable result observed.

EXPERIMENTS WITH DOGS.

These animals, like rats, appear to be totally immune to the action of the organism. They were subjected to intravenous inoculations of 0.75 c. c. of a fresh bouillon culture, but without developing any untoward results.

EXPERIMENTS WITH SHEEP.

Sheep have proved nearly as resistant as dogs. Two animals received intravenously and subcutaneously 1 and 2 c. c., respectively, of a twenty-four-hour bouillon culture. In the case of each sheep there was a temporary rise of temperature following the inoculation, which lasted about twenty-four hours. These animals were kept under careful surveillance for thirty-eight days, and during that time no after effect from the action of the organism was noted.

In connection with this experience it should be recalled that a number of Shropshire sheep were in immediate contact with the goats on the Pennsylvania farm where the disease was first observed. In no case have sheep contracted the disease by such exposure.

EXPERIMENTS WITH GOATS.

Nicole and Refik Bey, when writing of an infectious disease which was decimating the flocks of goats near Constantinople, said that, although the disease spread rapidly from goat to goat when the sick were pastured with healthy animals, they had found goats in the laboratory to be very resistant to all attempts at artificial inoculation. The results in the present instance warrant us in fully indorsing their conclusion regarding the resistant nature of goats, especially the common goat, when subjected to similar conditions.

The first goat upon which inoculation tests were made was a large aged male that had spent much of his life in harness in the vicinity of this city. He received intravenously 2 c. c. of a three-day-old bouillon culture on April 14, when his temperature was 102° F. There was no sudden marked change, but after several days 103.2° F. was recorded. The fever gradually subsided until normal was reached. No evidence of any effect from the inoculation, other than this rise of temperature, was noticed. On June 7 he was reinoculated intra-abdominally with 5 c. c. of bouillon culture obtained from the liver of a guinea pig which had died but three days previously. His temperature just previous to inoculation was 102° F., but it immediately rose until it reached 104.6° F. on the evening of the same day. On the following day 104° F. was recorded, 103.1° F. on the third day, and normal on the fourth. No indication of any other disturbance as a result of the inoculation was noticed at any time.

An aged female goat that had been previously kept in the city as a milk producer was inoculated intravenously with 5 c. c. of a bouillon culture (fourth generation) on June 20. Temperature at time of inoculation was 102° F. The first rise in temperature was noted on June 23, when 102.6° F. was recorded, with 103° F. on June 24. On the following day 103.4° F. was reached and the animal refused the greater part of its food. On June 26 inappetence continued and purging began, while the temperature dropped to 102.8° F. The following day, the seventh after inoculation, the patient was purging freely a quantity of slate-colored feces. Temperature, 102.2° F. On the 28th, although the excreta were still soft and whitish in color, there was no distress from diarrhea. The animal still refused food. On the following day, the ninth of the test, the appetite began to return, and the goat soon recovered its normal condition.

On July 10 goat No. 14, a small mature female, received intra-abdominally 4 c. c. of a bouillon culture obtained from the heart of a guinea pig. During the four days following the inoculation the goat neither ate nor drank. The maximum temperature was reached on July 16, when it registered 103.8° F. On July 24 diarrhea, with whitish mucous discharge, developed, which persisted for seven days, during which period the patient's appetite was again greatly impaired and capricious. The condition and strength of the animal rapidly wasted away. She remained incumbent much of the time, and when obliged to move walked with a staggering gait. Her illness was so serious at the crisis of the attack that her ultimate recovery was a matter of great surprise to those who were caring for her. Her convalescence was rapid as soon as the diarrhea was overcome, and she soon began to eat well and to make daily improvement in flesh and spirit.

Goat No. 15, a young native female, was fed 200 c. c. of a bouillon culture on July 23 and a like amount on the day following. Aside from a transitory rise in temperature of 1.4° F., there was no result apparent.

Another experiment was made on a grade Angora goat, No. 1741, the subject being a young female which received intraabdominally, on October 2, 1 c. c. of a bouillon culture from guinea pig No. 1140, which was inoculated with goat bouillon culture. Her temperature reached its highest elevation on October 8, when it registered 104.5° F., and no material change was noted until the decline developed about twenty-four hours before death. October 10 the subject became dull and inactive and diarrhea began to make itself manifest. On the following day violent purging had become established, the feces being thin, watery, and nearly white in color, the animal at this time appearing noticeably shrunken and weakened. On October 12 the purging still continued and the subject began to manifest extreme weakness. On the morning of the following day, the eleventh day of the test, the animal died. No indications of any respiratory disturbance were evidenced at any time during the course of the disease, although the lungs were found to be affected at autopsy. On post mortem examination the carcass showed great emaciation of the muscular tissues, which appeared whitened and bloodless. The mucous membranes were anemic. The heart was seen to be pale, with a few slight petechial hemorrhages beneath the epicardium around the superior border of the ventricles. Pulsations had stopped during diastole, leaving the ventricles filled with blood. The lungs showed a moderate attack of the characteristic pneumonia. The liver appeared darkened, in color, while the gall bladder was distended to the size of a man's fist. The fluid which caused this distension lacked the oily viscid characteristics of normal bile, but appeared like water of a greenish color.

The spleen of this animal was pale and shrunken to about one-half of its normal size. The kidneys were softened and anemic and the bladder contained albuminous urine. Rumen, reticulum, and omasum were, with their contents, in normal condition, but the mucosa of the abomasum showed a slight congestion, and a mucoid exudate was found to cover its entire internal surface. No food was found in the fourth stomach, its contents consisting of liquid only. A like congestion and slimy exudate were seen to extend through the duodenum. The large intestines were bloodless and empty, but the lymphatic glands of this region appeared slightly hemorrhagic. The blood vessels of the brain were somewhat congested, while the spinal cord presented nothing abnormal.

At the beginning of this experiment the weight of the goat was 45 pounds. Weighed again immediately after death, it was shown that there had been a loss of 7½ pounds during the course of the disease.

Pure cultures of the specific micrococcus were recovered from the tissues of this animal.

PRODUCTION OF TOXINS.

In order to ascertain if the micrococcus under consideration produced a toxin, a number of inoculation experiments were made both with the sterile filtrate of bouillon cultures and with the sterilized cultures.

The filtrates used in this experiment were obtained by growing a flask of bouillon culture for ten days at a temperature of 37° C. Afterwards the culture was filtered through a Chamberland filter (F), and, if proved sterile by media inoculations, the filtrate was then ready for use.

Four guinea pigs were used, each receiving the filtrate subcutaneously. No. 1151 received 1 c. c. of the filtrate February 25, but because of an accident it was necessary to remove the animal from the experiment before the test was completed. No. 1152 received 1.5 c. c. of the filtrate February 25, and seventeen days later, March 14, an inoculation of 0.5 c. c. of a virulent culture was injected. The guinea pig remained active and hearty, save for a temporary disturbance following the inoculation on February 25, until October 16, when it suddenly succumbed to an attack of pneumonia. The carcass was not emaciated, but, on the contrary, was well supplied with fat. Cultures made from the various organs failed to produce the *Micrococcus caprinus*.

No. 1153 received 2 c. c. of the filtrate on February 25, and seven days later 0.5 c. c. of a virulent culture, which was followed by a reinoculation of 0.5 c. c. of virulent culture ten days afterwards. Shortly after the application of the first inoculation of filtrate the animal was affected by dullness and loss of appetite, but after three days these symptoms disappeared, and the animal recovered its previous condition of perfect health, which it retained until October 18, when it died of enteric hemorrhage. The carcass of this animal was well nourished and showed no traces of wasting or emaciation. The lungs contained numerous circumscribed pigment areas, the remains of former hemorrhagic infarcts. As two hundred and twenty-eight days had elapsed since the animal received its first inoculation with a virulent culture of the *Micrococcus caprinus*, it was, of course, impossible to establish an undisputable relation between the lesions of the lungs and the action of this germ, but it is not at all impossible that these ecchymosed areas were former centers of inflammation resulting from the inoculation of March 14. Cultures made from the organs of this guinea pig gave negative results.

No. 1154 was inoculated with 3 c. c. of filtrate on February 25, which was followed by a rise of temperature and slight indisposition. Seven days later 0.5 c. c. of a virulent culture was injected, and ten days subsequently 2 c. c. of the filtrate. The general appearance of this animal for six weeks following its inoculation with virulent culture showed nothing amiss, but during the latter days of April it became affected with lameness in all its feet. Fissures gradually developed on the plantar surface of each foot, and the inflammation later extended to the joints of the legs. This condition continued to become more aggravated until the animal died, on May 12. In addition to the lesions of the legs and feet, there was a slight dropsical effusion within the abdominal cavity at the time of holding the autopsy, but cultures obtained from the tissues failed to show the micrococcus under consideration.

The effect of heat upon the toxins was obtained by heating the filtrate for thirty minutes at 60° C. Four guinea pigs were then inoculated, respectively, with 1, 2, 3, and 4 c. c. of this material, at the same time that four others received the same quantity of the filtrate which had not been subjected to such heating. Three days later these eight animals, together with two control guinea pigs, were inoculated intra-abdominally with 0.5 c. c. of virulent culture. The four guinea pigs receiving, respectively, 1, 2, 3, and 4 c. c of the heated filtrate died in twenty-one, sixteen, nine, and twelve days, respectively, after the injection of the virulent culture, while the check animals lived for nine and thirteen days. Three of those guinea pigs that received the unheated filtrate are at present writing in an apparently healthy condition, while guinea pig No. 2832, that was inoculated with 1 c. c. of the filtrate and three days later 0.5 c. c. of a virulent bouillon culture, died of typical takosis on the seventeenth day.

It appears from these experiments that the unheated filtrate possessed bactericidal properties and conferred limited power to prevent an attack of takosis, but when subjected to a temperature of 60° C. for thirty minutes its toxin was presumably destroyed, as no protective action was observed following its use.

In order to test further (see also remarks on treatment, p. 42) the immunizing effect produced by the administration of the toxins in the filtrate, 5 c. c. of this fluid were injected subcutaneously on September 18 into each of four goats, two being affected with scours and greatly enfeebled, and two healthy animals, Nos. 1936 and 721. The first two died within forty-eight hours, as was expected, but the latter two are still healthy. The extent of immunity conferred by this filtrate was the subject of further consideration, and for this purpose goat No. 1936 alone was used. The animal was a young female Angora goat weighing 48 pounds and received intravenously, on October 2, 1 c. c. of a bouillon culture prepared from the heart of a guinea pig that had died from a culture of goat spleen. At that time her temperature was 102.4° F. An elevation was noted on October 6, when 103.5° was recorded; on the 8th, 104°; and on the 10th, 105.2°, at which time purging became established. On October 11 the animal refused food, was unwilling to stand, and was purging freely, the feces being very light in color and covered with mucus. October 12, still purging; feces nearly white; temperature 104.2°. October 14, feces firmer, but still white; temperature normal; weight, 44 pounds; appetite improving; circulation of extremities impaired to such an extent that they feel cold to the touch; normal conditions quickly returned after this time. After an interval of twenty-five days from the time of first injection another inoculation was made with 2 c. c. of a virulent culture intraabdominally, since this method has always shown more positive results. In this instance the goat became dull and languid, which conditions, however, quickly passed away, and her temperature never exceeded 102.4° F.

That the immunity was conferred by the 5 c. c. of filtrate received on September 18 must appear evident when taken in connection with the results obtained with the check animal, goat No. 1741 (see p. 24), which died eleven days after the inoculation with a similar culture. After one month had elapsed from the date of the complete recovery goat No. 1936 was bled aseptically, and the sterile serum procured for further experimentation. Five guinea pigs were inoculated, respectively, with 1, 1.5, 2, 2.5, and 3 c. c., and three days subsequently received 0.5, 0.25, 0.75, 0.50, and 0.30 c. c., respectively, of virulent culture, which killed the check guinea pig in eleven days after an intra-abdominal injection. At the present time three of these guinea pigs show no inconvenience as a result of the inoculation, while the third and fifth guinea pigs, that received 0.75 and 0.3 c. c. of the culture, died on the forty-first and thirty-ninth day, respectively, the latter with takosis and the former of an intercurrent disease.

It will be seen at once that the immunizing properties of blood serum obtained from an immune goat were not perfect in their action when applied to the guinea pigs in this test, although the protection of three of the animals (Nos. 1, 2, and 4) offers sufficient encouragement to warrant further investigation along this line. Had the protective powers of the serum been theoretically effective, the guinea pig that died with takosis (the fifth of the test group) would have been the last one of the number to show the effects of the disease, as it received the largest amount of the serum and one of the smallest amounts of the virulent culture. Comparison of the duration of the affection in the case of the guinea pig that died of takosis thirty-nine days after the virulent culture was applied, with its course of only eleven days in the animal used as a check, indicated further that the serum exerted some retarding action upon the advance of the disease in this animal. This same serum has been subjected to a practical test on twenty goats in a flock of two hundred and fifty in which the disease is now prevailing. The results of the above treatment can not be obtained in time for this publication. The test with blood serum as an immunizing agent against takosis is at present too incomplete to warrant any accurate estimate of its protective value, and, although the few experiments herein recorded show encouraging results, the immunity has not yet been proved sufficiently constant or reliable to justify at present a recommendation of serum for general use as a protective agent.

After observing the apparent bactericidal properties possessed by the filtrate it was decided to ascertain the effect of the sterilized bouillon cultures. These were prepared by growing the culture for ten days in 5 per cent glycerinized peptone bouillon, then killing it by an exposure of thirty minutes to 60° C., and afterwards filtering through sterilized cotton. From this study it would appear that the toxins are extracellular and that they are destroyed by the above temperature, as the injection of this fluid failed to produce the least reaction in the inoculated guinea pigs; nor were the guinea pigs protected in the slightest degree from a subsequent inoculation of a pure culture, as will be seen from the following:

Six guinea pigs inoculated on November 7 with the sterilized cultures in doses ranging from 1 to 3 c. c. subsequently received, subcutaneously, 0.5 c. c. of a virulent culture simultaneously with two check animals. Deaths followed among the first group of animals on an average of sixteen days, while the two control animals died on the fourteenth and eighteenth days, respectively. Inoculation experiments were begun at the same time on a small flock of goats, each animal receiving 3 c. c. subcutaneously, which was repeated in ten days. The preliminary report in this instance confirms the work done on guinea pigs, and shows rather conclusively that the immunizing properties of sterilized cultures are practically nil.

MICROSCOPIC LESIONS.

Lungs.—Microscopically, the terminal bronchioles and alveolar passages present swollen walls and contain various amounts of mucous exudate and desquamated cells as a result of a catarrhal inflammation. In most cases where the diseased areas in the lungs of the goat were examined there has been found little pneumonic consolidation, but bronchiolitis is quite prominent. Some small areas of consolidation are seen with the alveoli and air sacs filled with granular debris and variable numbers of epithelial cells, red-blood corpuscles, and leucocytes. An active desquamation and proliferation of the epithelial lining membrane is present. The interalveolar septa show a considerable round cell infiltration. The blood vessels of the septa are distended and surrounded by migrated leucocytes. Frequently a bronchus is found affected, with the lumen containing a small number of desquamated epithelial cells and slight fibrinous exudate and leucocytes. A round cell infiltration is seen in the neighborhood of the bronchus, the walls of which are swollen, indurated, and granular in appearance. The surrounding peribronchial tissue shows in most cases an inflammation by contiguity. The pulmonary lesions observed in the guinea pig present the characteristics of a bronchopneumonia. The organism is occasionally found in the fibrinous exudate and in the blood vessels.

Liver.—In the liver of the guinea pig there appears to be a congestion of the blood vessels, especially in the portion lying beneath the capsule, and is accompanied by focal areas of fatty degeneration occupying the peripheral zone of the acini in the form of numerous small globules, which in some cells completely obscure the nucleus. The protoplasm of the hepatic cells is extremely granular. In the organ obtained from the goat there is no congestion, but the areas of fatty degeneration are observable, although in a small degree, and always in insular patches.

Kidneys.—The kidneys present the microscopic appearance usually observed in catarrhal or parenchymatous nephritis, with the most marked changes occurring in the cortex. Certain Malpighian tufts show an increase of cells due to the proliferation of the vascular epithelium, obscuring and compressing the capillaries. Increase of the cells of the tufts sometimes occurs. The intercapsular space is dilated and contains an albuminous exudate. The convoluted tubules show the epithelium to be swollen and granular, and in some cases desquamated, while the lumina of these tubules also show the presence of an albuminous deposit. As the micrococcus has not been found in the kidney on microscopic examination, the lesions here are presumably the result of the toxins.

Heart.—Localized areas of parenchymatous degeneration may be observed, involving isolated fibers or groups of fibers. Their contents are found to be fine granules of an albuminous nature, which do not completely obscure the striations or the nuclei of the muscle. In some fibers a more advanced stage has occurred, which results in the production of small, dark granules, accompanied with small droplets of fat. In the heart of the guinea pig the interfibrillar connective tissue shows a proliferation of the nuclei, and there is a slight indication of a round cell infiltration.

Spleen.—A microscopical examination shows a thickened capsule, which is wrinkled and contracted. An increase in the thickness of the fibrous trabeculæ proceeding from the deeper layer of the capsule and from the walls of the small blood vessels is the conspicuous feature, with the accompanying atrophy of the Malpighian corpuscles and splenic pulp. The connective tissue cells and delicate strands of fibrillated tissue are very noticeable among the lymphoid elements.

Small intestines.—The appearance of these tissues, especially of the duodenum, is that of a productive inflammation with exudation, associated with more or less necrosis of the mucosa. The mucous membrane of the small intestine shows extensive desquamation of the epithelial lining and at times a superficial or even complete necrosis of the glandular layer. The mucosa may also present a typical productive inflammation with exudation of a fibrinous character and small cell infiltration around the engorged blood vessels. The solitary follicles are hyperplastic. The serous coat is thickened and the blood vessels visibly distended. Scattered profusely throughout the exudate and within the blood vessels of the submucosa, as well as in the intact mucosa, are the specific micrococci.

BLOOD EXAMINATION.

The attention of one who is called to examine a goat suffering with takosis is at once attracted by the anemic, bloodless appearance of all the exposed membranes. So prominent is this symptom that efforts have been made to determine the effect of the disease upon the blood. The germ (*Micrococcus caprinus*) is readily recovered from the blood of the circulation in any part of the body of animals that have died as a result of the test inoculations or of the natural disease. It is found in the plasma, but never within the cells themselves. Ellenberger (Physiologie der Haussäugethiere) and R. Meade Smith (Physiology of Domestic Animals) give the number of red corpuscles in a cubic millimeter of normal goat blood as varying from 9,000,000 to 10,000,000. A count was made from the blood of several goats obtained for experimental purposes in the laboratory and the result was confirmatory of this statement in a very satisfactory degree. The average result of the count in these cases gave the number as 9,976,000 per cublic millimeter and about 9,200 leucocytes in the same amount of blood. Later a count was made from the blood of an Angora goat sent to the laboratory during the last stages of the disease.

The animal was greatly emaciated, of an anemic, debilitated appearance, and was suffering from profuse diarrhea. We have no means of knowing how long this goat had been affected by the disease, but evidently it had been ailing for some weeks. The count of red corpuscles in this instance gave 11,208,000, showing a material increase above the normal number. Other counts were made from the blood of two Angora goats that had been received at the laboratory in a healthy condition and afterwards inoculated with *Micrococcus caprinus*, one receiving 1.5 c. c. of a bouillon culture intravenously and the other 1 c. c. intraabdominally. Violent purging ensued in eight days in both cases. The count of the corpuscles of the blood was made before the animals recovered fully from the effects of their inoculation and when the purging was quite profuse. The result obtained by counting the corpuscles under these conditions was that the blood in the first contained 11,190,000 red-blood cells and 20,560 white cells per cubic millimeter, while in the second case the red and white cells numbered 12,160,000 and 18,420, respectively. The leucocytosis in these instances was chiefly due to an increase in the number of polymorphonuclear leucocytes and the eosinophiles. In another case affected with the natural disease the red corpuscles numbered 10,208,000 and the white corpuscles 14,860.

It will be seen from the few blood counts thus far made that the number of red corpuscles is not diminished; in fact, it is sometimes increased (polycythemia), especially during the presence of the diarrhea, and is probably only relative, coincident with the removal of the watery constituents of the blood. The individual red cells are small (normal size 4.1μ.—Ellenberger), pale, and light in weight, presumably the result of the loss of nitrogenous material. They are also changed in outline, particularly in the later stages of the disease, when they assume an irregular, misshapen form (poikilocytosis). The increase in the number of leucocytes (leucocytosis) is absolute and dependent upon the chronic nature of this infection. In explaining the phenomenon in this instance we are inclined to ignore the overproduction theory of Virchow and Ehrlich and accept the idea advanced by Von Limbeck, Jakob, and Goldschneider, who hold that the bacterial toxins circulating in the blood act in a chemotactic manner to attract into the blood stream leucocytes which were previously in the lymph channels and spleen, and that these white corpuscles added to those already in the blood produce the leucocytosis. The specific gravity of the blood was taken in a number of instances with the average record of 1.031. It is utterly impossible to determine the amount of hemoglobin present by means of the Von Fleischel instrument, as the greenish tint of the blood is not comparable to the red of the index glass. However, the amount of hemoglobin was relatively ascertained as 56 per cent by a modification from Schmaltz (Pathologie des Blutes und die Blutkrankheiten, Leipzig, 1896), considering the normal specific gravity of the blood of the goat as 1.042.

TECHNIQUE.

For the histological study of the pathological alterations, the tissues were fixed in either Graf's chrome-oxalic fluid, Zenker's fluid, or gradually ascending strengths of alcohol and hardened in dilute chloroform. They were then infiltrated and embedded in paraffin and cut in serial sections. In bringing out the pathological lesions various staining preparations were employed, including hematoxylin and eosin, Weigert's fibrin stain, Bismarck brown and eosin, Gram's method followed by eosin, alum-carmin, and carbol-fuchsin counterstained with methylene blue, the best and most distinct sections resulting from the first two mentioned agents.

DESCRIPTION OF PREVIOUS EPIZOOTICS OF ALLIED CHARACTER AMONG GOATS.

The first mention in foreign literature of any disease of goats simulating the one now under consideration seems to have been made by Pusch (12),[a] of Dresden. The disease appeared in the fall of 1894 among a number of goats recently brought from the Simmenthal of Switzerland for breeding purposes. Upon their arrival in Saxony they were sold to different breeders and in this way were scattered about in six neighboring towns and upon thirty various farms. Several days later a disease appeared simultaneously among the goats of this importation in five of the six towns in which they had been received, and it quickly spread to the neighboring goats with which they had been placed.

The animals were purchased on October 8, and were unloaded from the cars and delivered to their several owners on October 12. Nothing was seen to be wrong with them at this time, but after a few days complaints began to reach the authorities which stated that the goats were affected with cough and diarrhea. They were visited by Dr. Pusch on October 25, thirteen days after their arrival from the south. On the first farm which he visited, he found three imported goats and one native goat sick. All of them coughed in response to percussion with a short, superficial, painful cough. The native goat seemed to be more seriously affected than those recently arrived from Switzerland. Its temperature was 40.5° C., respiration 35, and pulse 110; mucous membranes yellowish; nostrils widely distended; breathing labored and painful; appetite poor. The animal was so sluggish that she refused to stand. On another farm he found that one of the goats had been killed and its viscera buried. The heart and lungs were recovered and examined, but under the existing circumstances the results were not satisfactory. The heart was seen to be gray-red and very poor in fat. Pneumonia was present, accompanied with enteritis. Mice inoculated from these lungs gave negative results. On this farm the disease spread among the native goats to a serious extent. The incubation period was about ten days. Sheep kept in the same pasture were not affected. The greater part of the imported goats sickened after their arrival, and, as they were all bought in the Simmenthal and were not unloaded en route, infection during transportation was impossible. The disease appeared simultaneously among most of the goats of this importation, and quickly spread to the natives with which they had been herded, causing great loss among the latter animals.

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[a] These figures refer to bibliography at end of this article.

The infected farms were quarantined until the diseased animals had either died or recovered, which required but a few months, as the affection disappeared voluntarily during that time.

Another outbreak of a very similar disease among goats was reported by Storch (14).

The native goats of Schmalkalden are of large size, rugged, good producers of milk, and, until the importation of Saanen goats from Switzerland, they were very healthy.

Twenty Saanen goats were imported and placed among the native flocks in May, 1894. In July the disease had become so widely spread that the authorities sent Schutz and Storch to investigate. Storch states that the report of Pusch, 1894, is the only one in German literature describing a disease which resembles this in any way, while Hutcheon's pleuro-pneumonia of goats in South Africa may be the same thing, but he is unwilling to decide.

Of 620 goats in Steinbach-Hallenburg 331 became affected, and many of these died, but no accurate statement of the number of deaths was obtainable. In the acute form the goats refuse food, become dull and depressed, and lie down most of the time. Their breathing becomes labored and painful; pulse often reaches 120 to 140 per minute; cough is always present. About one-half of these cases are fatal, many of the animals dying in convulsions and opisthotonos.

In the chronic form, a cough is always present, frequently accompanied by nasal discharge. The disease is lingering and persistent, but apparently does not affect the appetite.

Examination of the lungs showed collapsed areas in one or both anterior lobes. Mucous membranes of the bronchi were reddened, thickened, and covered by a slimy coating. Bacteriological examination revealed the presence in the lungs of numerous oval to round bacteria, frequently in pairs, but occasionally single, while the blood, spleen, and liver proved negative. White mice inoculated subcutaneously with cultures showed a staring coat and dullness, but recovered. A rabbit two months old, inoculated with scrapings from a diseased lung, died atypically in three days. Hepatized areas had developed in its lungs, however, and the presence of the organism in these tissues was established.

Healthy goats placed in isolated stalls in stables sheltering diseased animals became infected.

Susceptibility appeared to increase with age, since young kids were not affected. Mortality of the acute and chronic forms considered together reached about 25 per cent.

Careful inquiry failed to give any trace of a similar disease in the Simmenthal where these goats were purchased. Further importations of goats into the Kingdom of Saxony were prohibited at once as a result of this outbreak.

Various experiments were made in the matter of treatment, but the best results were derived from the inhalation of creolin.

Nicole and Refik Bey (10), of Constantinople, describe a pneumonia among the goats of the region adjacent to the Gulf of Ismid, it having been brought there by goats purchased in the interior of the country.

The symptoms were first fever, then loss of appetite, cough and nasal discharge, disturbed breathing, and soon the animal began to lag behind the flock, appearing dull and languid. The disease lasts a long time and the animals become somewhat paralyzed four or five days before death. The attack is not commonly accompanied by enteritis. Calves and sheep kept in the same flock were not affected. Microscopic examination showed red and gray hepatization, and the vessels filled with leucocytes. The pleura was thickened, and exudation into the pleural cavity was moderately abundant.

They have constantly isolated a cocco-bacillus from the lungs. It is sometimes alone and sometimes in association with the colon bacillus or with *Bacillus pyocyaneus*. It was never found in the blood. It seems both by its form and character to belong to the hemorrhagic septicemia group. The bacillus does not retain its stain when treated by Gram's method. On liquid media it appears sometimes as a diplococcus, and again as a lance-shaped bacillus, resembling in its contour and size the pneumococcus of Talamon-Fraenkel. When the nutriment in the media is abundant, its form is round and there is a decided tendency to form chains. Mice were most susceptible to this germ. A very small quantity of culture injected subcutaneously caused death in ten to twelve hours from septicemia. Two cubic centimeters subcutaneously kills rabbits in eight days, forming abscesses in the lungs. A test goat died in four weeks, emaciated, and with limbs paralyzed during the last few days of life. Cocco-bacilli were recovered from all visceral organs. Another goat recovered. A third goat showed diarrhea and fever the day after being inoculated and then recovered. It was subsequently reinoculated with fluid from a hepatized lung and died in one month. All goats tested in the laboratory proved very resistant. Calves and dogs were inoculated with 5 c. c. of a pure culture without results.

The men who were first interested in introducing well-bred Angora, Thibet, and Cashmere goats into this country encountered some thoroughly discouraging experiences, which were very probably due in a measure to the ravages of the disease under consideration. As early as the year 1854 a prospective purchaser of Thibet goats living in the State of Georgia was warned by a naturalist of note against completing his purchase for the reason that these goats, "like the llamas of the Andes, could not be successfully acclimated in a locality under 10,000 feet above the ocean." The purchase was consummated in spite of the friendly warning of the naturalist, and the final owner (2), in recounting his experiences later, wrote: "His opinion proved to be correct, as all of the Thibet goats, pure and grades, in my flock died in a few years after I had purchased them, from a disease of their lungs combined with dysentery."

A writer (1) in the Country Gentleman of February 4, 1875, also reports serious losses in a flock placed in his care on a farm at Rapidan, Va. Although he records no specific symptoms, the following quotations have great interest to all who are making a study of takosis:

> In the early cold weather the goats began to sicken. I had the sick ones removed to other quarters, and wrote for remedies to Mr. E. I studied Randall also, but nothing cured them. They died, and more were taken sick. I sent for Mr. E., the owner of the goats, and when he came he said the difficulty was cold and hunger, though they had more than a "little hay and fodder" besides additional meal, much more in proportion than my sheep, which at that time were running at large without shelter and doing well. * * * The next morning a fine young buck which had been apparently well the night before was brought out in a dying condition. Mr. E. examined it closely and said it was a decided case of liver disease, an infectious epidemic which Angora goats were subject to in their own country, and regarded as so fatal by the Turkish shepherds that they said of it, "There is no cure but Allah."

Pegler (11) in the year 1885 described what he termed "A disease peculiar to goats." It will be seen upon reading the following excerpt from his work that his description of the scourge that appeared among the members of his flock might, in most particulars, very well be applied to a flock affected with takosis. From the page describing symptoms were borrowed the following:

> The first thing that is noticed is a falling off of appetite, which may at first be slight, but soon gets worse until it is a difficult matter to get the animal to eat at all. The result, of course, is that it rapidly loses flesh and falls away to a skeleton. Sometimes, however, the appetite remains good, but the emaciation goes on just the same, though the process is slower. The breathing is sometimes labored and the breath nearly always very unpleasant. A cough is very often an accompaniment of the disease, leading one to suppose, with other symptoms, that the lungs were affected, but this is seldom the case. The one prevailing feature which can never be overlooked is the general bloodlessness of the animal. This is shown by the pale color of the gums and inner surface of the lips, and also of the membranes lining the eyelids, which in health are of a bright red.

Before the disease is far advanced diarrhea sets in, which begins with a slackness of the bowels. This soon gets worse, however, and, though it may be stopped for a time, it is almost sure to break out again, owing to the failure of the digestive organs from the impoverished condition of the animal. The diarrhea may last for several weeks, but as it advances it often takes the form of dysentery. The poor creature then becomes too weak to stand, and it generally dies uttering plaintive cries and moans. There are other symptoms which occasionally manifest themselves, such as swelling beneath the jaws and weakness about the limbs, the animal always standing with its head down and back arched, looking the picture of misery and dejection.

Strange to say, in nearly all the postmortems which have been made and reported to me, there has been no organic disease. Internal parasites are sometimes discovered, but not in sufficient quantities to greatly affect the animal's health, much less cause its death, which in all cases is due to exhaustion.

ECONOMIC IMPORTANCE.

A few years ago the flocks of Angora goats in this country were comparatively unimportant in number, and they were nearly all of them kept in southern latitudes, but during recent years the raising of these animals has received a remarkable impetus. New uses have been discovered for the fleece, they have been widely exploited as brush eradicators, and their flesh has been more readily accepted as a food product, until at present they have reached an established, settled value in many of the larger live-stock markets. As a result of the widespread interest thus awakened in them, many stock raisers have made purchases of foundation stock with the intention of establishing therewith a profitable flock. Others have made larger purchases at the start, being unwilling to wait for the slow natural increase in numbers of their animals. By means of numerous transactions the animals have been placed in widely distributed northern localities to which they were formerly strangers, but the serious losses caused to these investors by outbreaks of takosis served as a check to many prospective purchasers, and the Angora goat industry was, in consequence, subjected to a discouraging setback, and has not expanded to the proportions which it would otherwise have reached.

Now that the cause of the trouble has been determined, one may be warranted in claiming that the disastrous effects of all outbreaks up to the present time may in the future be avoided in large measure. The owner of the flock of goats will now see the importance of deciding upon the nature of the ailment affecting them just as soon as any general disease is noticed; and when takosis has appeared and been identified, if he will at once apply the precautionary measures and the course of treatment to be recommended later in this work, he should avoid many of the discouraging experiences of his predecessors.

As has already been stated in this article, the most serious losses that have come to our notice have occurred among goats that were removed from southern localities to new regions far to northward, and that had not become fully acclimated in their new surroundings. In many instances the trouble has appeared very soon after the arrival of the animals at their destination, even before they have recovered fully from the serious strain incident to the long journey by rail.

There is always a value to be derived from the confirmatory statements of many witnesses. Various observers are sure to offer a variety of observations upon any subject in which they may have a common interest, and for the purpose of presenting to the reader as generalized a knowledge as possible of the effects of takosis upon a flock of goats, and also for showing how diversified is the territory in which the ravages of the disease are being felt, it has been deemed advisible to present the following extracts received by this Bureau with reference to the disease.

From Knapp, Wis., the following was received:

> I have in my charge about five hundred goats, and they have been dying from what I called stomach worms; but of late I have come to the conclusion that something else is the matter with them. They lose their appetite, grow thin in flesh, cough and get weak, and then lie down and die. Some linger along two or three months. There is from one to five in the flock that show the symptoms all the time, and from one to two die per week. They first cough, then lag behind the flock at night when coming to the barn. Then there is lack of appetite, they grow poor and weak and look gaunt all the time as though they have been starved

A letter of inquiry from Pittsburg, Pa., asks:

> Would some of you let me know what the proper feed is for goats through the winter when they have no pasture? I bought a few Angora goats and so did a few of my neighbors, and they are dying. The flock that we obtained them from was very poor; in fact, I never saw anything poorer to live than the goats were when we received them. I feed mine on corn and oat chop, half and half, and corn fodder, and cut some apple brush, but for all I would do my goats died with scours.

A writer from Langhorne, Pa., sends the following record of his observations:

> To look at our goats in the yard you would say they looked fine, and you could hardly pick out one that you might think was not quite up to the average, yet to-morrow morning you would find four or five down on their sides or otherwise. If picked up they might move off slowly and eat a little, but the next morning they would be down again. The animals will not get up or stay up, but will linger in this manner for some days, smelling badly and bleating occasionally or groaning, with head bent around on side or under them, and finally die. Sometimes, as a result of lying so long, they get apparently choleraic discharges from the bowels, which is offensive, but this does not show at first, and is not the primal cause.

Tioga County, Pa., has for several years had a flock of Angora goats, representing among its members some excellent specimens of the breed. The owner of this flock, in describing the course of takosis, writes:

> None of the diseased goats recovered. It took a long time for many of them to die. They tried very hard to live, and some of them succeeded in living for weeks, only getting weaker and weaker and finally just fading away. Some had diarrhea but many did not.

In making a report of postmortem findings, a correspondent from Iowa mentions one of the characteristic symptoms of takosis as follows:

> The amount of bile is from one-fourth to three-fourths of a pint in each goat. A healthy goat only has, as I find, about a tablespoonful. This goat has been ailing for two weeks, but only refused to eat for two days. I have lost one-third of my flock and have not been able to save even one goat that has become sick.

A breeder in western Illinois states that he has lost one hundred out of a flock of four hundred, and that two of his neighbors have suffered proportionate losses. These goats were all well sheltered. He considers the disease some sort of cholera, reasoning from the fact that the animals were all affected with diarrhea.

The following extracts, from a letter received just as this paper was ready for the press, from the owner of a large flock of Angora goats in Michigan, confirm several of the statements made in the introduction of this article:

> We personally suffered a loss last winter in animals that we had brought from Texas in November, 1901, from this disease, and thus learned of the trouble. * * *
>
> We gathered together a herd of all grades of goats for the purpose of studying them and finally arrived at the conclusion that, so far as the Angora goat is concerned, the animal most susceptible to the disease, was the result of careless breeding, or to be more exact, too much inbreeding, thus lowering its vitality and leaving it open to the attack. * * *
>
> The care, feed, and shelter of the various grades of animals we have had was all alike, and it resulted, as stated, in the survival of the carefully bred, free from inbreeding Angora goat.

Other reports of like nature have been received from goat owners in Oregon, Missouri, Massachusetts, Virginia, and Maryland, all describing the affection as an incurable weakening and wasting away, usually accompanied by uncontrollable diarrhea and occasionally cough. The death rate has been very high in the flocks from which reports have been obtained and ranges from 30 to 85 per cent.

Another feature of takosis, which is of great economic importance to the breeder of goats, is experienced in the unavoidable tendency to abortion which is manifested by all pregnant females that are affected with the disease. Females of the sheep and goat families will never reproduce in a prolific manner if in a wasted, emaciated condition during the breeding season. Many of them will fail to come in heat, and others, although passing through the period of estrum normally, will fail to conceive. Takosis is essentially a wasting disease, and one of the marked results of its attack upon a flock of breeding goats is seen in the shrunken kid crop of the following season.

It is rare indeed for a pregnant doe to complete her term of gestation if attacked during this period by takosis. Abortion follows almost invariably. As might naturally be expected, the accident of abortion under these circumstances always ends fatally, as the animal is unable, in her already weakened condition, to withstand the shock incident to delivery. Many times the fetus dies in utero, and thus becoming a foreign body to the maternal organism, it but hastens the eventual collapse of the doe. In holding autopsies on the bodies of affected pregnant does, it has been occasionally noted that the death of the fetus preceded that of the mother by a few days, and the fetal decomposition present has indicated that it played a prominent part in causing the death of the adult.

One flock has been brought to our notice which contained about 1,600 does at the commencement of the breeding season in the fall of 1901. They were seriously affected with takosis at this time, and in consequence there were but seventeen living kids produced in the following spring.

Another instance is reported where the total increase of a flock of over 1,000 does for the year was limited to eleven living kids.

DIFFERENTIAL DIAGNOSIS.

PARASITISM.

The condition which will most frequently be mistaken for takosis in goats is parasitism. In common with sheep, goats serve as hosts for a formidable array of animal parasites, and the loss directly or indirectly due to parasitic invasions must annually serve as a serious tax upon the goat raisers of the country.

The effects of internal parasites upon the goats are very similar in many of their outward manifestations to the symptoms of takosis. There is a persistent unthriftiness, although the appetite of the animal remains good. The fleece does not retain its proper luster. There may be considerable snuffling of the nose, accompanied by frequent coughing. The animal may become affected with diarrhea, more or less severe, and its accompanying weakness. The eyes lose their brilliance and gradually assume a dull sunken appearance. The formation of an edematous tumor beneath the jaws is frequently noticed during the later stages of a serious invasion. These, in a general way, are the symptoms resulting from an attack by animal parasites, but it must be remembered that there are species of worms that find their natural habitat in some particular organ, and that, in consequence, it is impossible to give an accurate enumeration of the symptoms that may be manifested in any given case under the general heading of parasitism.

The symptoms produced by the local disturbance of the affected part will predominate, while others, frequently caused by parasitic invasion, will be entirely lacking. Careful postmortem examination will quickly disclose the presence of parasites. A differential diagnosis previous to death of the animal may, however, be made by giving due consideration to the various symptoms manifested by these diseases. First of all, the infectious nature of takosis, when compared with the enzootic course of a parasitic invasion, will justify one in making a definite diagnosis. In attacks of takosis, symptoms of pneumonia will be frequently noted, especially labored breathing or rapid respiration. These symptoms are not diagnostic of parasitism. The edematous lump under the jaw, so frequently present in cases of parasitism, fails in takosis. The luster of the fleece is less affected in takosis, while diarrhea is more frequently noted. Continuous coughing and snuffling, while diagnostic of the presence of lungworms, are not characteristic of takosis and are noted only occasionally in cases of this disease, unless there is a complication with some other affection.

ANEMIA.

In goats this is very rare, and when it does occur it is usually secondary to some previously existing disease, such as chronic pneumonia, peritonitis, or to poor food and starvation. It does not assume an infectious nature, and may be differentiated from the anemic condition accompanying takosis by the absence of the specific organism on microscopic examination.

WATERY CACHEXIA, OR HYDREMIA.

This usually results from poor feeding, innutritious food, or pasturing on low ground. The natural goat pasture is high dry land. The animal is weak, readily exhausted, breathes rapidly, and its heart palpitates. The mucous membranes of the eyes, nose, and mouth are pale and swollen. The edema which is present about the head, neck, and abdomen will serve to differentiate this disease from takosis. This edema of the head disappears when the animal lies down. Icterus may accompany the disease when the discoloration of the mucous membrane easily establishes the nature of the affection. A change of pasture and a more nutritious diet are accompanied by a return of health to the flock.

CONTAGIOUS PNEUMONIA.

There have been several instances recorded in which flocks of goats have been affected with a contagious pneumonia.

Hutcheon (6) has met with this epidemic in South Africa; Steel (13) has seen it in East India; and it has also been brought to the attention of French (3 and 8) and Italian (9) veterinarians.

Soon after the outbreak of this disease in the flock many of the animals will become affected with a cough. The temperature rapidly rises until occasionally as high as 107° F. is recorded. The appetite becomes disturbed or disappears altogether, and there is slight nasal discharge. The conjunctiva appears brownish or bronzed, the vesicular murmur of the lungs becomes modified, the pulse quickened, and the breathing accelerated, labored, and painful. The affected animals always evince pain when pressure is applied between their ribs.

The postmortem examination of these cases shows the lesions to be chiefly confined to the thoracic cavity. The visceral pleura is usually adherent to the thoracic walls. The diseased lung is solidified and enlarged throughout one-half to three-fourths of its substance. It is covered with a firm elastic fibrinous membrane.

Respecting the nature of the disease, Dr. Hutcheon writes:

> It was a specific infectious form of pleuro-pneumonia, affecting goats only, cattle and sheep remaining free from infection, although constantly exposed to it. The disease was introduced into the Cape Colony by a shipment of Angora goats from Asia Minor, where the disease is represented as being indigenous.

At the present time contagious bovine pleuro-pneumonia has no existence among the flocks or herds of America, but since the goats of other countries have been proved susceptible to an analogous disease, the above mention of its leading characteristics may not be out of place.

TREATMENT.

PROPHYLAXIS.

In the study of takosis four points have been brought prominently into view which may properly be grouped together when considering measures for the prevention of the disease. It has been shown that the most destructive outbreaks have occurred among the goats that just previously have been shipped from a southern locality to a more northern latitude, and this fact suggests the need of caution in the removal of animals in this direction. Sudden climatic changes should be avoided so far as possible, and when shipments of goats for breeding purposes are to be made which necessitate their transportation northward over considerable distances the changes should be made during the months of summer or late spring, and not in the fall or winter, when the contrast of temperature will be so much greater.

Earlier writers have called attention to the fact that Angora goats do not take kindly to transportation from one climate to another. Hobson (4) states that the native proprietors of Angora flocks in Asia Minor unanimously assert that this goat can not be transported from the place where it was born to a neighboring village of a different altitude without suffering a deterioration, and although able to resist both heat and cold they can not withstand much humidity, either in their pastures or folds.

The second precautionary measure is closely allied to the first, namely, Angora goats should be provided with stables that are thoroughly dry, not alone in their ability to shed rain, but on account of being erected upon ground that has perfect natural drainage, and these should be accessible by them at all times, as the effect of rains upon the general health and strength of these animals has been frequently proved to be very disastrous. So great is their natural aversion to a wetting that they will seldom get caught out in a shower if shelter is within their reach, but will leave their browsing and march under cover before the downpour arrives. The reason for this is obvious. Their fleece is wholly lacking in yolk; consequently it will not shed water in the least, and a fall of rain immediately soaks the animal clear to the skin.

As a third measure of prevention may be mentioned careful feeding. No animal is as well fortified against the attack of an infection when reduced by lack of nourishment as it is when in vigorous, thriving condition. Among the predisposing causes of disease usually enumerated by general pathologists will be found debility due to insufficient or unsuitable food, and, although the reason for this may not be established beyond the reach of argument, it is pretty generally conceded that the continued lack of proper nourishment establishes in the blood of an animal an abnormal degree of alkalinity which grants an increased susceptibility to the inroads of pathogenic organisms.

Another preventive measure to be mentioned here is one that is applicable only after the disease has made its appearance in the flock. The segregation or isolation of all affected animals as soon as they evince any symptoms of the disease will be found a most valuable means of protection for those that remain unaffected, and a strict quarantine over all of the diseased members of the flock should be maintained so long as the disease remains upon the premises.

In our previous experiments for the purpose of procuring an immunizing agent against this disease, the results were such as to warrant a practical application of the sterile filtrate previously described (p. 26) to several flocks of goats generously placed at our disposal. The fluid thus prepared has been injected into the skin over the shoulder of goats in doses of 3 c. c., with varying results. One flock, originally consisting of eighty-two animals, had been decimated by takosis until it numbered but thirty-two. These animals received two inoculations ten days apart, and immediately after the last injection they were transported in wagons late in November to a point thirty-eight miles away. On account of the condition of the roads, the trip required about two days. During this time the goats were without food or drink and were not unloaded. Two of them died, one on its arrival at the farm and the other not till three days later, although it was scouring badly upon reaching its destination. The remainder of the band seem in a healthy condition and are the most sturdy of the flock of six hundred to which they have been added. At a later test of this filtrate, made in one of the Western States, upon a flock of goats, the effect of treatment was most unsatisfactory. The goats were inoculated twice with the remedy with an interval of ten days. Recent letters from the owner state that there is no improvement in the condition of the flock, but that the fatalities continue to occur with the usual frequency. He has since been advised to make use of the medicinal treatment mentioned below. From another Western breeder a most flattering report has been received. He states that after the use of the prophylactic treatment the disease disappeared from the premises, and up to the time of writing all of the animals on the place had remained in a thriving condition.

THERAPEUTICS.

Medicinal treatment has proved unsatisfactory in many of the cases of takosis to which it has been applied. Previous to the study of the disease the treatment was directed against the pneumonia, and for a short time marked improvement followed; but it was merely coincidental, as deaths occurred later with the usual regularity. Then intestinal disinfectants and astringents were suggested, but these did not prove efficacious. The most pleasing results that have been derived from the use of drugs in our experiments at the laboratory have followed the administration of calomel given alone in 0.10-gram doses twice daily for two days, to be followed by powders composed of arsenic, iron, and quinine, as follows:

	Grams.
Arsenious acid	1.40
Iron, reduced	12.00
Quinine sulphate	6.00

Mix and make into twenty powders, giving one to each adult goat morning and evening at the conclusion of the administration of calomel. After an interval of two days, this treatment is repeated. In case the diarrhea persists, the sulphate of iron has been substituted for the reduced iron, with beneficial effects.

CONCLUSIONS.

As a result of the present preliminary investigation, the following conclusions have been reached:

1. The disease here described as takosis has appeared in many parts of this country, but particularly in the Northern States, where it has caused great loss to many breeders of Angora goats.
2. It is a progressive, debilitative, contagious disease, characterized by great emaciation and weakness, with symptoms of diarrhea and pneumonia, and causes a mortality of 100 per cent of those affected and from 30 to 85 per cent of the whole flock.
3. From the carcasses of numerous animals that have succumbed to this disease a new organism, *Micrococcus caprinus*, has been recovered in purity and is presumably the etiological factor.
4. This micrococcus possesses pathogenic properties for goats,

chickens, rabbits, guinea pigs, and white mice, but not for sheep, dogs, or rats.

5. Although the disease has been described before (11), so far as could be ascertained no bacteriological investigations have been previously made.

6. Medicinal treatment was attempted with varying success, while the immunizing experiments thus far conducted (although too few to permit of any conclusive statement or accurate estimate as to their protective value), have shown highly encouraging results. When accompanied with measures of isolation and disinfection, the treatment may prove of great assistance in the suppression and eradication of the disease in an infected flock.

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U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF ANIMAL INDUSTRY—BULLETIN No. 46.

D. E. SALMON, D. V. M., Chief of Bureau.

THE MILK SUPPLY

OF

TWO HUNDRED CITIES AND TOWNS.

BY

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AND

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WASHINGTON:
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1903.

LETTER OF TRANSMITTAL.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., May 15, 1903.

SIR: I have the honor to transmit herewith a manuscript dealing with all phases of the milk supply of two hundred cities and towns in the United States, and recommend that it be published as Bulletin No. 46 of the series of this Bureau.

Respectfully,

D. E. SALMON,
Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

Dy.—48.

PREFATORY STATEMENT.

This report upon "The milk supply of 200 cities and towns" is very largely the work of Mr. R. A. Pearson, the Assistant Chief of the Dairy Division prior to September last.

If the full statistics of the market milk industry could be given, the importance of this form of dairying would be better appreciated. It is not known how many persons are actually engaged in the production, transportation, and sale of milk for market. Based upon the Twelfth Census of the United States, about 1,000,000,000 gallons of milk are sold annually by the owners of the producing cows, for consumption in the natural state or for household purposes. The value of this product, joined with the capital invested in production, transportation, distribution, and delivery, constitutes an interest of great magnitude.

The business is also one of interest and importance to a vast army of consumers. It is not surprising, therefore, to find so much attention being given to the improvement of this branch of dairying. A knowledge of what has already been accomplished and what is now being done to promote this good work should contribute to further progress. It is with that view that the facts included in the accompanying report have been collected and compiled.

HENRY E. ALVORD,
Chief of Dairy Division.

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CATALOGUE OF CITIES.

[Including all of the 161 cities in the United States having a population over 25,000 each, also 39 selected cities and towns of smaller size.]

States and cities, population, and page reference to discussion of dairy data.

[Populations are according to the Twelfth Census.]

States and cities.	Population.	Page.
Alabama:		
Mobile	38,469	45
Birmingham	38,415	45
Montgomery	30,346	46
Arizona		47
Arkansas:		
Little Rock	38,307	47
California:		
San Francisco	342,782	47
Los Angeles	102,479	48
Oakland	66,960	49
Sacramento	29,282	50
San Jose	21,500	50
Alameda	16,464	51
Colorado:		
Denver	133,859	51
Pueblo	28,157	52
Colorado Springs	21,085	53
Trinidad	5,345	53
Connecticut:		
New Haven	108,027	54
Hartford	79,850	54
Bridgeport	70,996	55
Waterbury	45,859	55
New Britain	25,998	56
Delaware:		
Wilmington	76,508	56
District of Columbia:		
Washington	278,718	57
Florida:		
Jacksonville	28,429	59
Georgia:		
Atlanta	89,872	59
Savannah	54,244	60
Augusta	39,441	60
Hawaii:		
Honolulu	39,306	60
Idaho		61
Illinois:		
Chicago	1,698,575	62
Peoria	56,100	66
Quincy	36,252	66
Illinois—Continued.		
Springfield	34,159	67
Rockford	31,051	67
East St. Louis	29,655	67
Joliet	29,353	67
Aurora	24,147	68
Evanston	19,259	68
Moline	17,248	69
Ottawa	10,588	69
Indiana:		
Indianapolis	169,164	70
Evansville	59,007	71
Fort Wayne	45,115	72
Terre Haute	36,673	72
South Bend	35,999	72
Richmond	18,226	73
Iowa:		
Des Moines	62,139	74
Dubuque	36,297	74
Davenport	35,254	74
Sioux City	33,111	75
Council Bluffs	25,802	75
Cedar Rapids	25,656	75
Burlington	23,201	76
Clinton	22,698	76
Ottumwa	18,197	77
Keokuk	14,641	77
Marshalltown	11,544	77
Kansas:		
Kansas City	51,418	78
Topeka	33,608	78
Kentucky:		
Louisville	204,731	79
Covington	42,938	80
Newport	28,301	80
Lexington	26,369	80
Louisiana:		
New Orleans	287,104	81
Maine:		
Portland	50,145	82
Lewiston	23,761	82
Waterville	9,477	82
Belfast	4,615	83

States and cities, population, and page reference to discussion of dairy data—Continued.

States and cities.	Population.	Page.
Maryland:		
Baltimore	508,957	84
Massachusetts:		
Boston	560,892	86
Worcester	118,421	87
Fall River	104,863	88
Lowell	94,659	89
Cambridge	91,886	90
Lynn	68,513	90
Lawrence	62,559	91
New Bedford	62,442	91
Springfield	62,059	92
Somerville	61,643	92
Holyoke	45,712	93
Brockton	40,063	93
Haverhill	37,175	94
Salem	35,956	94
Chelsea	34,072	94
Malden	33,664	95
Newton	33,587	95
Fitchburg	31,531	96
Taunton	31,036	96
Gloucester	26,121	96
North Adams	24,200	97
Woburn	14,254	97
Melrose	12,962	97
Wakefield	9,290	98
North Attleboro	7,253	98
Michigan:		
Detroit	285,704	100
Grand Rapids	87,565	101
Saginaw	42,345	101
Bay City	27,628	101
Jackson	25,180	102
Battlecreek	18,563	102
Lansing	16,485	103
Minnesota:		
Minneapolis	202,718	103
St. Paul	163,065	104
Duluth	52,969	105
Mississippi	....	106
Missouri:		
St. Louis	575,238	106
Kansas City[a]	215,170	107
St. Joseph	102,979	108
Joplin	26,023	108
Montana:		
Butte	30,470	109
Nebraska:		
Omaha	102,555	109
Lincoln	40,169	110
South Omaha	26,001	110
Nevada	....	111
New Hampshire:		
Manchester	56,987	111
New Jersey:		
Newark	246,070	112
Jersey City	206,433	114
Paterson	105,171	114
Camden	75,935	115
Trenton	73,307	115
Hoboken	59,364	116
Elizabeth	52,130	116
Bayonne	32,772	116
Atlantic City	27,838	117
Passaic	27,777	117
New Brunswick	20,006	117
Montclair	13,962	117
New Mexico	....	123
New York:		
New York	3,437,202	124
Buffalo	352,387	127
Rochester	162,608	128
Syracuse	108,374	129
Albany	94,151	130
Troy (and Lansingburg)	73,246	131
Utica	56,383	131
Yonkers	47,931	132
Binghamton	39,647	132
Elmira	35,672	133
Schenectady	31,682	133
Auburn	30,345	133
Watertown	21,696	134
Mount Vernon	21,228	134
Lockport	16,581	135
Rome	15,343	135
North Carolina	....	136
North Dakota	....	136
Ohio:		
Cleveland	381,768	137
Cincinnati	325,902	137
Toledo	131,822	138
Columbus	125,560	139
Dayton	85,333	139
Youngstown	44,885	140
Akron	42,728	140
Springfield	38,253	140
Canton	30,667	140
Hamilton	23,914	141
Warren	8,529	141
Fostoria	7,730	142
Oklahoma	....	142
Oregon:		
Portland	90,426	143
Pennsylvania:		
Philadelphia	1,293,697	144
Pittsburg	321,616	145
Allegheny	129,896	146
Scranton	102,026	146
Reading	78,961	147

[a] Including Kansas City, Kans.

States and cities, population, and page reference to discussion of dairy data—Continued.

States and cities.	Population.	Page.
Pennsylvania—Continued.		
Erie	52,733	147
Wilkesbarre	51,721	148
Harrisburg	50,167	148
Lancaster	41,459	148
Altoona	38,973	149
Johnstown	35,936	150
Allentown	35,416	150
McKeesport	34,227	150
Chester	33,988	150
York	33,708	150
Williamsport	28,757	151
Newcastle	28,339	151
Easton	25,238	151
Lebanon	17,628	151
Meadville	10,291	152
Phœnixville	9,196	152
Rhode Island:		
Providence	175,597	153
Pawtucket	39,231	154
Woonsocket	28,204	154
South Carolina:		
Charleston	55,807	154
South Dakota	....	155
Tennessee:		
Memphis	102,320	155
Nashville	80,865	156
Knoxville	32,637	156
Chattanooga	30,154	156
Texas:		
San Antonio	53,321	156
Houston	44,633	157
Dallas	42,638	157
Galveston	37,789	157
Fort Worth	26,688	158
Utah:		
Salt Lake City	53,531	158
Vermont	....	158
Virginia:		
Richmond	85,050	159
Norfolk	46,624	159
Washington:		
Seattle	80,671	160
Tacoma	37,714	160
Spokane	36,848	160
West Virginia:		
Wheeling	38,878	161
Wisconsin:		
Milwaukee	285,315	162
Superior	31,091	163
Racine	29,102	163
La Crosse	28,895	163
Oshkosh	28,284	164
Greenbay	18,684	164
Marinette	16,195	164
Waukesha	7,419	165
Wyoming	....	165

THE MILK SUPPLY OF TWO HUNDRED CITIES AND TOWNS.

INTRODUCTION.

No branch of the dairy industry has received more attention in recent years or made more substantial progress than that of producing milk for delivery to consumers or shipment to market. Nearly one-third of all the milch cows in the United States are necessary to supply the people with milk for use in its natural state.

The demand for improvement in the milk supply and milk service has led to much better practices on the part of many of those connected with different phases of the business. Producers give more care to the selection and breeding of cows, their health and housing, food and water; to the matter of cleanliness in milking and the care of milk while on the farm. There have been marked improvements in vessels and methods of shipping, means and manner of transportation, storage, distribution, and delivery. The small glass jar, or bottle, as a complete and sealed vessel, to pass unopened from producer to consumer, if desired, is a great advance in equity, purity, and security of delivery. It has been rapidly improved from the clumsy form in which it was introduced twenty-five years ago, and has almost reached perfection as a glass vessel for this purpose. It is yet too heavy, short lived, and expensive, however. The ideal package for milk carriage and delivery, light, clean, safe, and so cheap as to be used only once and then destroyed, has yet to be found.

Municipal governments, as well as voluntary civic organization and private enterprise, are giving more and more attention to this important subject of the milk supply, its proper regulation, supervision, management, and improvement.

Much reformatory work is still needed in the improvement of all those parts of the business which are within the control of the producing farmers. This requires the united efforts of all public and private agencies which can be interested in it and brought into action.

More important is the system, or present lack of system, in distribution and delivery. Producers and consumers are jointly carrying an untold burden in supporting armies of men and "means of transportation" engaged in duplication, or rather multiplication, of labor, where intelligent cooperation would be a distinct benefit to all concerned. Here and there some encouraging work has been done, but the problem needs to be earnestly studied. A great opportunity awaits the successful practical reformer in this important field.

It is desirable to know what has already been done and what measures have been found efficacious, in order to guide new movements or revise old ones in the same direction. To this end the compilation of facts has been made which will be found in the following pages. The report shows the legal requirements as to market milk in every State and Territory having laws upon the subject, and includes a more or less detailed account of the milk supply of all the 161 cities in the United States having a population over 25,000 each; also of 39 selected cities and towns of smaller size, the smallest being Belfast, Me., with a population of 4,615. The information given is nearly all based upon official documents and special reports from officers who are charged with the enforcement of so-called milk laws and ordinances.

Present conditions are well set forth in the material collected. In numerous instances recommendations for improvement are included, as given by health officers and milk inspectors. This does not imply that they are indorsed, although many of them are worthy of indorsement. This Department has recently published an article under the title, "Market milk: A plan for its improvement,"[a] which was prepared after a careful study of much of the material used in the present report. It sets forth a plan which, it is believed, could be followed in any town or city where there is a live interest in the subject. That plan applies chiefly to the further improvement of the better class of dairies and would have little direct influence on the poorest. It should therefore be supplemented by certain legal requirements and their thorough enforcement. The report now presented will be especially useful in places where some regulation of the milk supply is first contemplated or where better regulations are needed. The correspondence of the Dairy Division shows there are many such, including cities and towns having no legal provisions whatever in reference to milk. Inquiries have come in large number for suggestions as to the best way to supervise market milk, and especially as to methods generally employed.

It is hoped that this summary statement of conditions now prevailing throughout the country in reference to market milk will encourage action toward the improvement of that important food supply and lead to a larger use of it. So much has been said and written regarding impure market milk that many persons have become unnecessarily alarmed. For this reason any fair inquiry into this subject which brings out facts and suggests steps that should be taken for the benefit of the industry should be welcomed by milk inspectors and consumers as well as milk producers and dealers.

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[a] Seventeenth Annual Report, Bureau of Animal Industry (1900), pp. 158–193.

STATISTICS AND GENERAL INFORMATION.

The usual methods by which milk is distributed in cities, towns, and villages are known to every observing person, and those by which it is produced are known to most people; but statistical facts regarding the use of milk are not generally known, although they are exceedingly interesting and suggestive. All of the statistics obtained relating to the market milk of the two hundred municipalities have been arranged in tables (pp. 26–44), in which data for any city or town can be readily seen and compared with others. Only a few of these statistics will be repeated here. Figures showing the total amount of milk used in large cities are very impressive, but they do not give the extent of the use of milk as well as those representing its per capita consumption or supply. The following statement shows the maximum, minimum, and average number of pints of milk apparently consumed daily in each of the four classes into which the cities and towns have been arranged:

Daily per capita supply of milk.

	Class I.	Class II.	Class III.	Class IV.
Number of cities reporting	38	39	63	39
Maximum ......pints..	1.17	2.00	1.42	1.18
Minimum ......do....	.27	.10	.12	.23
Average ......do....	.61	.63	.58	.57

It is believed that these figures are reasonably accurate. They are based upon the population according to the last census and estimates of milk used daily furnished by local officials best qualified to judge. In not a few cases careful records are kept by milk inspectors of the milk sold by each person having a license, but generally it has been necessary to depend upon estimates. Whenever the estimates appeared to be unreasonably large or small, they were returned for revision.

The average quantity of milk per capita provided in the daily supply and presumably consumed in the largest cities (Class I) is found to be 0.61, or practically two-thirds, of a pint; in cities of Class II (including all those with a population between 50,000 and 100,000), the average consumption is 0.63 pint; in Class III (cities having a population between 25,000 and 50,000) it is slightly less, or 0.58 pint; and the average of 39 cities and towns, with a population less than 25,000, is 0.57 pint. In Boston, Worcester, Newton, and Fitchburg, Mass.; Elizabeth and Hoboken, N. J.; Providence, R. I.; Minneapolis, Minn.; Pueblo, Colo.; Elmira and Mount Vernon, N. Y.; and Sioux City, Iowa, the average daily per capita consumption of milk is reported as 1 pint or more. By referring to the separate statements for these cities it will be seen that some explanation is usually given for this seemingly large use of milk. The smallest average consumption of milk in the larger cities is 0.27, or practically one-fourth, of a pint per capita; this is in New Orleans, where the supply is notably inadequate and unsatisfactory. The average per capita consumption of milk in four of the largest Southern cities is only 0.38 pint, which is less than one-half of the average supply in large Northern cities.

Satisfactory statistics concerning skimmed milk were obtained from only a few of the larger cities reporting. In Indianapolis, Ind., and St. Joseph, Mo., the largest amounts were given, the supply being about one-third of a pint per capita, in addition to the whole milk used. Several cities reported a little less than 0.1 pint, and several others as little as 0.01 pint per capita. Boston, Mass.; Jersey City and Elizabeth, N. J.; New York, N. Y.; St. Louis, Mo.; and Bridgeport, Conn., report that no skimmed milk is used.

The quantity of cream per capita in the larger cities varied in supply from 0.01 pint daily to 0.19 pint.

The number of stores and wagons engaged in the sale and distribution of milk shows that the methods of handling it differ considerably in different places. Milk is sold from 12,000 stores in New York City, or an average of 1 store to every 286 persons, and it is delivered from 4,000 wagons, or an average of 1 wagon to every 859 persons. In all the cities of Class I, there is an average of 1 store to 1,176 persons, and in Class II, to 2,149 persons, showing that in the smaller cities wagons are mainly depended upon. In cities of the first two classes, including all with a population above 50,000, there is an average of 1 wagon to about 784 persons. A factor to be considered in this connection is the number of cows within the city limits. Some cities report several thousand cows in herds within their boundaries, and most cities have quite a number of cows kept singly for the private use of the families owning them.

The tables show a wide variation in the prices paid for milk in different parts of the country. Producers usually receive, on their farms, from 2 to 3 cents per quart in the summer and 3 cents or more in winter, but these limits are often exceeded. On the other hand, in some cases and in some seasons, producers receive less than 2 cents a quart. It was attempted to ascertain the exact prices received by producers on their farms, but in some cases the question seems to have been misunderstood, and the price reported was apparently that paid for the milk delivered in the city. Allowance should be made for this possible error, especially whenever the price seems to be too high. The average price paid by consumers of milk when retailed in small quantities is about 6 cents in summer and 7 cents in winter.

In numerous instances an advance of 1 or 2 cents per quart for milk from "model dairies" is reported. But the milk from many so-called model dairies is sold at the same price as other milk, and in most of these cases the term probably refers to dairies that are conducted in a manner only slightly better than the ordinary. The term "model dairy" is differently understood by different persons, hence the number of these dairies reported to be near cities and towns can not be fairly compared. Usually only one, two, or three are reported for a city and often none.

A truly "model dairy" is one which is conducted in the best practicable manner known to science. They are not necessarily places where money has been lavishly expended for fine blooded cattle and highly adorned buildings; such places, if they are not properly conducted, are far from "model." But they are dairies where milk is produced and handled that is as clean and wholesome as milk can be made; the cows are in good condition, free from disease in any stage, and frequently examined by a skilled veterinarian, who removes from the herd any suspicious animals; none but wholesome feeds are used; the stable is abundantly lighted and well ventilated, often thoroughly cleaned and kept in a correct sanitary condition; the cows are kept clean and comfortable; the attendants are healthy and cleanly; all utensils are sterilized daily; great care is taken to protect the milk from contamination; the milk is promptly cooled, and it should contain less than one one-thousandth part as many bacteria as are found in much of the milk regularly sold in cities and towns.

A model dairy does not require a large outlay of capital, but it requires a keen intelligence and unremitting care in its management. Some increase in running expense is necessary, as would be expected. Such dairies are few, but their number is slowly increasing. One of the chief reasons why they do not increase more rapidly is that the public does not appreciate the advantages of their product and seems unwilling to pay a slightly advanced price for it. If the question were generally understood, there would be such a demand for high-grade milk at fair prices that model dairies would quickly come to be the rule instead of the exception. When consumers are willing to pay enough to encourage dairymen to exercise close supervision over their cows and to take all of the precaution necessary to insure milk of high quality and purity, from both chemical and bacteriological standpoints, and will insist on having such milk, then that kind will be amply supplied. It is the duty of dairymen themselves to help bring about this condition. Milk is cheaper than most other foods (even when it is sold at an advanced price made necessary by extra care in its production), and for this reason, as well as others, it is well suited to form a large part of the dietary.

The territory from which milk is supplied to cities and towns might be divided into three zones. The first includes the city itself, which often, as has been stated, has large numbers of cows within its limits; the number is sometimes in the thousands. The second zone includes the district surrounding the city, from which milk is carried by wagons. These wagons usually arrive in the city in time to serve milk early in the morning; they may deliver the milk of the previous day or the milk of the same morning and the previous evening. The third zone includes a much greater territory, from which milk is carried to the cities by railroads, trolley lines, and steamboats. In about a dozen cities more than three-fourths of the supply comes from this zone. Seven cities—New York, Philadelphia, Newark and Jersey City, N. J., Baltimore, Md., Memphis, Tenn., and Lynn, Mass.—report milk received from points distant 200 miles or more. The average of the longest distances from which milk is supplied to cities of Class I is practically 100 miles, while the average of the longest distance from which it is supplied to cities of Class II is practically 50 miles. The milk trains bringing milk from medium distances to the cities usually arrive between 8 and 11 o'clock in the morning with milk of the same morning and previous evening. Much of this is held over in refrigerator tanks of the dealers to be served the following morning, when a part of it is twenty-four hours old and the remainder thirty-six hours. Trains carrying milk the longest distance usually arrive in the night, so that their milk can be served the following morning and is not any older than much of that coming from nearer points.

The portion of milk delivered in glass bottles was stated for only about half of the cities reporting. In some cases almost all of the supply is handled in this way. It appears from the reports that the average retail price is no higher in cities where a large portion is served in bottles than in cities where bottles are but little used. The delivery of milk and cream in bottles is increasing in favor. This should be so, for the system has many advantages. Each bottle is a sufficiently exact measure, holding a quart, pint, or half pint, and unless it has been very carelessly filled, contains its right proportion of cream. Bottles are closed packages and thoroughly protect their contents from dust and foul air. They may be easily sealed and their contents guaranteed. The bottles are heavy and fragile and expensive, but the greatest objection to their use is on account of their abuse. They are sometimes refilled without having been properly cleansed. This is a dangerous practice, as milk might be put into jars that had been in some way infected with the germs of a contagious disease, and thus carry the disease to other houses and families. Milk jars are easily sterilized, and whenever this is done there seems to be no serious objection to counterbalance the many advantages of their use.

The pasteurization of market milk is not generally practiced. A few cities report that a small portion of the milk is thus treated. According to returns, the largest quantities of pasteurized milk are sold in Los Angeles, Cal.; Pittsburg, Pa.; St. Paul, Minn.; Kansas City, Kans.; Salt Lake City, Utah; Reading, Pa.; Troy and Binghamton, N. Y.; Council Bluffs, Iowa; and Lexington, Ky. Several cities report that no pasteurized milk is sold within their limits. The practice of pasteurization appears to be gradually extending. Yet the medical fraternity is divided in opinion as to its expediency, and the best sentiment favors natural milk produced and delivered in such a pure and protected condition as to be greatly superior to any pasteurized article. Too often milk is offered for sale with the claim that it has been pasteurized, when it has actually been more harmed than helped, the process to which it has been subjected being unworthy the name. If done at all, pasteurization should be in the hands of competent persons, having efficient apparatus.

MILK LAWS AND ORDINANCES.

In thirty-five States there are laws referring to market milk. In nine other States (and Territories) there are pure-food laws which have a bearing upon the milk supply. In twenty-six States there are officials whose special duty it is to enforce these laws. Full copies of all the laws but two or three of the latest are included in previous publications of the Dairy Division. Almost every city and many towns and villages have ordinances or board of health regulations concerning the milk supply. Abstracts showing the State requirements and also the local requirements, so far as available for the 200 cities and towns here reported upon, will be found in the following pages. (In the abstracts, effort is made to state only the most important features, often omitting the repetition of details of enforcement, the usual authority for inspectors to perform their work, methods of taking samples, etc.) In addition to the special milk laws, general pure-food and sanitary laws and regulations are sometimes construed to apply to milk.

Too often milk laws and ordinances are faulty because their requirements are not clearly expressed. The form of expression is sometimes so cumbrous that the meaning is unintelligible to the average reader, or the requirements may be vague or obviously inexact, or they may be expressed in very general terms, thus rendering execution practically impossible. For example, some laws prohibit the use of any cow feed that is fermented. A strict interpretation of this would exclude silage, a most excellent dairy feed. This could hardly have been intended; but, if one feed is excepted, the exemption of other fermented feeds could be demanded. A law may require dairy stables to be well lighted. What does this mean? A stable considered by some persons to be well lighted would be very poorly lighted from the standpoint of others. A better way of expressing this requirement would be to name a minimum number of square feet of unobstructed windows for a given cubic space within.

On the other hand, some laws and ordinances go to the opposite extreme. They seem to show an effort to include the regulation of almost every detail of dairy work. It is generally considered impracticable to enforce such laws, and gradually their requirements are more and more ignored until attention is given to none of them or to only a few that can be most easily enforced.

It is an open question whether State laws or local regulations may be the more efficient in improving the milk supply. It is the general practice to leave to local authorities all control after the milk is within the city limits, but in a few cases States exercise authority within the cities and towns as well as elsewhere. It is probably true that the milk supply of the smaller towns receives better official attention when its control is in the hands of the State. State inspectors visit the small towns occasionally, at least when it is shown that their presence is needed, and this is much better than no inspection, which is the rule in many towns like the one from whose health officer the following letter was received:

> It is humiliating to be compelled to confess that a city which is well advanced in all other matters of sanitation should be without ordinances regarding the milk supply. On two different occasions before the city council assembly I moved that such ordinances be enacted, and both times the matter was shelved for the alleged reason that it might offend the susceptibilities of some milk venders.

The argument that the State should control the milk supply, because local regulations have no force beyond the city limits, has been shown by numerous cities to have little weight. In places which are not sufficiently protected by the laws of the States in which they are situated or the laws of other States from which milk is received, the matter is thus managed: It is provided by local ordinance that no milk shall enter the corporate limits unless it comes from a dairy holding a permit, or license, from the city authorities. The city can make its own conditions for issuing permits. These are usually given only to dairies actually inspected or which furnish satisfactory evidence of being in approved condition. The permits may be canceled for cause. A thorough system of milk and dairy inspection on this basis affords ample protection to milk consumers, as the source of the milk supply can be held completely under local control.

City ordinances relating to milk supply are similar to State laws, but generally more detailed and more clearly stated. They are often supplemented by regulations and rules of the local boards of health. The character of the city requirements, as well as those established by State authority, can best be ascertained by examining the abstracts of the laws, ordinances, etc., which are given elsewhere in separate statements for cities and towns. A few milk ordinances are printed in full in Appendix I (p. 165); also a number of sections taken from other ordinances which are of interest, because they show commendable ways for prescribing different requirements.

The subjects of most frequent legislation in connection with the supervision of market milk are shown by the statement below. The milk ordinances and regulations of 126 cities were examined with especial care, and the number of those having similar requirements are given. The most popular subjects for legislation are thus readily seen:

Subjects of most frequent legislation in connection with market milk.

Subjects.	Number of cities.	Subjects.	Number of cities.
Dairies:		Care of milk:	
License or permit required	12	Milk vessels to be nonabsorbent	5
Special authority for inspections	58	Milk vessels to be thoroughly cleaned	32
Pure water supply	8	Milk to be promptly removed from the stable	11
Drainage of barnyards	12	Straining	9
Stables:		Cooling and aerating	15
Proximity to other buildings	6	Conditions of storage	23
Light	15	Sale of milk:	
Ventilation	32	Licenses, or permits	92
Floor space	15	Licenses to be publicly displayed	24
Air space	10	Source of supply to be posted	14
Cleanliness	47	General inspection in cities	75
Removal of manure	25	Signs on wagons	79
Drainage	17	Unsanitary milk prohibited	109
Other than dairy animals to be excluded	4	Confiscation of impure milk	30
Sanitary milk room	14	Definite standard for composition	67
Employees:		Skimmed milk prohibited	12
Personal cleanliness	20	Skimmed milk permitted conditionally	61
Contagious disease (to be reported)	15	Bottling at farm	8
If exposed to contagious disease	25	Storage of milk for sale	23
Cows:		Milk tickets to be used but once	16
Provisions for examination	58	Milk wagons to be covered	12
Diseased cows	21	Milk wagons not to carry garbage	5
Unwholesome food forbidden	77	Sellers to register customers	7
Pure water supply	40		
Cleaning cows	27		
Milk rejected at calving time	33		

In most places having ordinances the sale of unsanitary milk is prohibited, but not infrequently in such general terms that the prohibition is practically without force.

The usual standard required for milk is 12 per cent total solids, including 3 per cent of fat. In a few cases higher standards are in force during all the year except the summer months. In some ordinances the standard is expressed in this peculiar manner: "Milk shall contain at least 12 per cent of milk solids, of which 3 per cent shall be fat." This literally means that the milk must contain three one-hundredths of twelve one-hundredths, or much less than 1 per cent of fat.

So much trouble has been experienced in some cities in regulating the sale of skimmed milk that in a few cases the sale of this cheap and excellent food is prohibited. The difficulty arises from the fact that dealers are allowed to carry skimmed milk in the same vehicles with whole milk or keep it in the same refrigerators or chests. It is then a simple matter to substitute the one for the other in selling to customers who are incapable of detecting the difference or unable to get redress. Some cities require all skimmed milk to be sold from cans that are painted blue or another distinguishing color. In one place the vender must give to the consumer a printed slip on which it is stated in large type that the milk is skimmed. In one or two other places skimmed milk must be peddled in vehicles different from those used for whole milk. Such methods have been proved so simple and effective that they should be adopted in cities where skimmed milk is now excluded. A good supply of this article, sold honestly on its merits, is of so much benefit to consumers, and especially to the poorer classes, that prohibition of its sale is inexcusable.

Many different penalties are provided for the violation of milk laws. They are usually fines and imprisonment, but in a few towns it is required that the names of violators be published, thus notifying the public who have been convicted of selling poor milk.

In many cases milk dealers have adopted the commendable practice of issuing rules and instructions to the producers supplying them with milk. A copy of a set of these rules is shown in Appendix II (p. 181). Such rules are a most valuable supplement to the ordinances. The "Fifty dairy rules" issued by this Department, in suitable form for posting in stables and milk rooms, have been widely distributed to dairymen through milk dealers and milk inspection officials, and by being published in various places.

An excellent list of the conditions which should be found at a well-conducted dairy is given in Appendix III (p. 182). These requirements form the chief part of the contract between the Essex County (N. J.) milk commission and the dairyman whose milk receives the indorsement of this commission.

No attempt is now made to offer what might be called an ideal milk law. Such would be suggestive in the many cities and towns where new legislation is being considered, but it is believed that suggestions as useful can be had by a study of the laws which are already in force. An ordinance suitable in one city or town might be quite inapplicable in another. For example, the larger cities, where dealers purchase their milk in such a way as to know practically nothing of its source, should have laws different in many respects from those in force in places where all the milk sold is produced by the persons who sell it. The regulations should be as clear and brief as possible, and those relating to milk should be enacted together, so they can be printed separately for distribution. In many cases the distribution of ordinances is rendered almost useless because they are long and cumbersome, or because the milk regulations are mingled with those on other subjects. In one city requirements regarding the milk supply alternate with those regarding the burial of the dead.

It is a serious mistake not to consult with reputable dairymen and dealers when laws concerning them are being considered. Such persons welcome the enactment and rational enforcement of proper measures to regulate the production and sale of milk. The prohibition of adulteration and unsanitary methods helps their business by driving out competitors whose false claims of excellence succeed in holding the trade of many customers.

SUPERVISION OF THE PRODUCTION AND HANDLING OF MARKET MILK.

With very few exceptions, there is some supervision of the milk supply in all cities in the United States having a population over 50,000. Much less supervision is exercised in cities with a population between 50,000 and 25,000, and in smaller cities and towns supervision is the exception rather than the rule. It is easily seen that in small places, where persons are known or may soon become more or less known throughout the entire community, the same need for official attention to the milk supply does not exist as in more populous centers. Yet this is not sufficient reason for ignoring the subject altogether, as is too often done.

There is the widest variation in the methods followed in different places and the character of the work performed. As stated, in many cities and towns this matter receives no attention, or almost none, and, in some of these, adulterations and general neglect of sanitary measures may be found on every hand, if the replies to inquiries from this office may be relied upon. But it should be added that in some places, where there is little or no supervision, the quality of the milk is excellent.

As has been explained, most of the States have more or less definite laws relating to the milk supply of cities and towns. In very few of them, however, is there any real effort at supervision by State officials. In Iowa and New York and one or two other States regular corps of milk inspectors are kept in the field. Some are located permanently in the larger cities and others make occasional unannounced visits to smaller places. In general these officials plan their own routes, and respond promptly to calls from places where their presence is particularly desirable. Their duties are largely the examination of milk samples for adulteration. The lactometer is relied upon mainly to indicate suspicious samples, and these are later subjected to more accurate tests. The effect of a visit of the State milk inspector to one town, where he is apparently too seldom seen, is shown by this statement from the health officer:

> The only protection the citizens have had from impure milk is an occasional visit from a State milk inspector, who invariably caught an offender and emptied his cans in the gutter; and some of the other dealers hearing of it, hurried back to their homes and left their customers unsupplied.

Some inspections of the sanitary conditions of dairies and milk stores are made by State authorities, but these are not customary except for special cause, such as an outbreak of disease or evidence of unusual conditions requiring attention. The New Jersey board of health has prepared blanks on which reports of inspections are made and which show how thorough it is proposed they shall be in that State. (See Appendix IV, p. 187.)

Although in some cities and many towns there is no local supervision of the milk supply, except an occasional action of the board of health or police in connection with a particularly flagrant case, yet, on the whole, there is much more work done along this line by local officials than by State officials; the former, however, often act under State laws.

Milk ordinances and regulations being considered health measures, their enforcement is generally intrusted to the board of health. When it is proposed to accomplish something along this line, special officers are appointed to take charge of the work. They are usually given the title of "milk inspector," but not infrequently their titles are longer and indicate additional duties, such as "inspector of milk and vinegar," "inspector of milk, provisions, kerosene oil, and vinegar," etc.

Officials in most of the cities having a population over 100,000 (Class I) reported fully upon the work performed in the supervision of their milk supply, and officials in a large portion of the cities with population between 50,000 and 100,000 (Class II) did likewise. Details could be furnished from only a small portion of the cities between 25,000 and 50,000 population (Class III), and of those of less than 25,000 population (Class IV). From these reports interesting data were obtained, which are tabulated as follows:

Abstract of interesting items from cities of the different classes.

Items and grouping of same.	Class I.	Class II.	Class III.	Class IV.
Amount annually expended in supervision of the milk supply:				
Cities reporting	29	33	40	31
Largest amount reported	$13,000	$2,500	$2,500	$1,200
Smallest amount reported	$1,000	0	0	0
Average amount reported	$2,953	$685	$421	$282
Milk samples tested for composition:				
Cities reporting	37	32	52	38
Largest number reported	79,657	12,000	5,000	4,000
Smallest number reported	0	0	0	8
Average number reported	6,834	1,076	521	471

Abstract of interesting items from cities of the different classes—Continued.

Items and grouping of same.	Class I.	Class II.	Class III.	Class IV.
Milk samples examined bacteriologically:				
Cities reporting	30	27	39	29
Largest number reported	390	125	43	275
Smallest number reported	0	0	0	0
Average number reported	77	7	2	16
Dairy herds in city limits:				
Cities reporting	29	25	34	29
Largest number reported	5,500	100	200	83
Largest number inspected reported	560	100	200	83
Smallest number reported	2	0	0	0
Smallest number inspected reported	0	0	0	0
Average number reported	297	21	21	12
Average number inspected reported	124	18	31	11
Dairy farms contributing to the supply:				
Cities reporting	17	18	37	30
Largest number reported	4,000	800	300	127
Largest number inspected reported	300	228	250	127
Smallest number reported	69	15	12	6
Smallest number inspected reported	0	0	0	0
Average number reported	686	167	65	38
Average number inspected reported	114	64	37	29

By an examination of these figures, as well as the separate reports upon different cities and towns, in another part of this publication, it is readily seen that most of the inspection work consists of testing samples of milk to ascertain if they contain as much fat and other solids as required by the standard. This is very useful, but certainly not more so than inspections for other conditions that may have even more effect upon the wholesomeness of milk than its adulteration by skimming or watering. The health of the cows producing milk, the health of the persons who handle it, and the conditions to which it is exposed are too often left out of consideration altogether by consumers as well as public-health officials. Yet there is little doubt that much more harm has resulted from the use of milk that has been contaminated through neglect of these things than from the use of adulterated milk. It is a commercial fraud to decrease the value of milk by the addition of a cheap ingredient, such as pure water, or by the removal of a valuable ingredient, such as fat (in cream), but this is insignificant compared to the evil of allowing milk to become dangerously contaminated, as may easily result when general sanitary conditions are neglected in connection with its production and care.

Milk laws, ordinances, regulations, etc., are usually quite well enforced, so far as the requirements regarding the composition of milk are concerned, but beyond that the enforcement is very imperfect. For example, it is commonly required that cows shall be kept in a healthful place and fed only wholesome food, etc., but such clauses are seldom noticed. Nothing whatever is known in most cities of the source of a large part of the milk sold, as many farms are never inspected. The conditions at almost any city in this respect are well described in the report of an inspector at Washington, D. C., which is abstracted on page 58.

The methods of work are quite similar throughout, and all details need not be given here. It is practicable to keep a correct list of producing dairies and places where milk is sold by having them licensed. This is the first essential. It is then simply a question of finding everyone on the lists and keeping an office record of the results of the inspections. Special care must be taken in the collection and marking of samples, as these acts have to be fully described in prosecutions. The official report of the method employed in Boston is as follows:

> Collections of samples for inspection are made on every week day and frequently on Sunday. The time varies very much according to circumstances, but most of them are made in the early morning and forenoon, though often a district is visited in the afternoon or evening. The usual method of collecting milk samples is as follows: The collectors go to the different districts to which they have been assigned the previous day, and begin their work very early in the morning, usually about 2 or 3 o'clock. Each carries a satchel in which are sample cans, bottles for return samples, tags for identification of the specimens collected, blank receipts, sealing wax, etc. At the time of taking a sample the collector makes a series of memoranda on a tag, which, before leaving the wagon, he affixes by means of a piece of copper wire to the handle of the sample can. The memoranda include every important point in any way connected with the taking of the milk—the name on the wagon, the license number, the name of the driver in charge, the time and exact locality, the number of cans on the wagon, the kind of can from which the sample was taken, whether the same was marked "skimmed milk," whether a sealed portion of the sample was delivered, and to whom, and any unusual or peculiar circumstances. These notes are made in the presence of the driver; and the tag, securely fastened to the sample, serves for its identification, and may later be used to refresh the memory of the collector on the witness stand in case of prosecution. In every case the person from whom the sample is taken is asked if he desires a sealed portion of the same. If the answer is in the affirmative, a 3-ounce bottle is filled, properly labeled by means of a small tag, and sealed in such a way that the latter can not be removed without breaking the seal. The collector then delivers the bottle to the person in charge, who signs a receipt for the same. As soon as the collector has obtained a sufficient number of samples he proceeds to the office, and having delivered them to the chemist, prepares to make a second trip. If, as frequently happens, he arrives at the office at such an early hour that nobody else is present, he locks his samples into a small closet, to which only himself and the chemist have keys. The second trip is made, as a rule, during the forenoon among the stores. The different districts of the city are not visited with any fixed regularity, and thus it happens that the dealers have no idea when they may next expect a visit, and hence can not feel that having been inspected to-day there will be no risk attending the conveyance of adulterated milk to-morrow. Collections are frequently made on several consecutive days in the same district by one, two, or all the collectors, and certain districts may be thus visited twice in the same morning.

A further idea of general methods may be obtained from copies of different kinds of forms used, which are shown in Appendix IV, (pp. 187–210). They include forms for application for license, forms on which reports of dairies are made, licenses, etc. Useful suggestions regarding the supervision of market milk may be obtained from an examination of these forms.

The applicant for a license is commonly required to make a simple formal request for the privilege to sell milk. This may be on a blank form containing only a few lines. In some cases this form has printed on its face or back a few of the requirements of the ordinance, or the ordinance in full (see p. 188). In at least one city the applicant must declare that his cows and the persons in his family and in his employ are free from certain dangerous diseases, and he must agree to give prompt notice of the occurrence of disease (see p. 189). In another case the applicant must agree to numerous conditions explicitly stated (see p. 189). In a few cities the applicants must furnish a more or less detailed statement of the conditions obtaining on the dairy farms or the general conduct of the business proposed (see p. 193). The advantages of requiring such a statement before a license is granted are readily seen. Probably then, more than at any other time, special effort will be made to answer all questions satisfactorily. If the dairy is subsequently inspected and reports of conditions as found are made upon blanks like the one originally filled out, they can be conveniently compared and the differences for better or worse readily noted. It should be remembered that it is as important to give attention to facilities for handling milk after it arrives in the city as before, and forms for this kind of inspection are in use in a few places (see p. 195). Some States and several cities have special forms for use in inspecting dairies from time to time, and some of them call for many important details (see p. 196). A form upon which additions of cows to a herd must be reported is sometimes used (see p. 199).

Licenses, or permits, are usually brief, simply stating that the person or concern named is permitted to sell milk in the city, etc., until a certain time, unless the license is sooner revoked. In some cases separate licenses are issued for stores and wagons. It is not uncommon to print a part or all of the milk ordinance or regulations upon the license, thus keeping always in sight some at least of the requirements (see p. 173). A special form may be used for notifying negligent persons of the requirement that they must be registered, or licensed, and others to give notice that the license number must appear on wagons (see pp. 200 and 203).

The forms most commonly used in making inspections of milk in cities and towns are those giving data regarding the collection of milk samples and upon which prosecutions may be based (see p. 205). Special forms are also sometimes used for giving notice that a sample of milk has been taken (see p. 206); for reporting its analysis (see p. 206); for giving notice of the confiscation and perhaps spilling of condemned milk (see p. 206); and for recording data when stores and wagons are inspected, etc. A special form is sometimes used to compel the discontinuance of the use of bottles at houses where contagious disease exists and giving permission to resume using them when the danger is past. Warnings of violations of the law are sometimes made on special forms (see p. 209). Many different methods of keeping office records are followed. In one city the "card system" appears to be used with success (see p. 210).

It should not be amiss here to mention the desirability of having as the official whose duty it is to supervise market milk one who possesses practical knowledge of the subject, as well as ability and integrity. Many such are engaged in this work, and their efforts are approved and encouraged alike by milk consumers and the better class of milk producers and dealers. It is hard to overestimate their value to the community. But, unfortunately, a few persons intrusted with this important work have wrong conceptions of their duties and sometimes they do more harm than good. The official who thinks that everyone engaged in the business of producing or selling milk is intentionally a lawbreaker, or he who constantly seeks to annoy those under his jurisdiction by petty and unreasonable requirements, does a great wrong. For the best results to all concerned, the utmost care should be taken in selecting the person who will have charge of the enforcement of milk laws.

SUGGESTIONS FOR THE IMPROVEMENT OF MARKET MILK.

Those who reported upon the milk supply were asked to mention the chief improvements which had recently come to their attention, and to suggest methods by which further improvements might be brought about. The improvements reported by the greatest number related to the dairies where milk is produced, and they showed that considerable advance has been made in the character and healthfulness of the stock, the conditions under which milch cattle are kept, and the methods of handling milk. The chief improvement shown by inspections in the cities was the decreased use of chemical preservatives in milk.

Many excellent suggestions were received regarding the improvements named and others needed, and they will be found elsewhere in connection with the separate statements for cities and towns. A few of the better ones are repeated below. Some exceedingly impracticable suggestions were also received. Naturally, the needs which are given for some places are well met in some others, yet the list includes points that might profitably be considered in every city. They are so clearly stated that comment upon them is unnecessary, and are as follows:

The registration of all dairies.

Official indorsement of properly conducted dairies.

Inspection of all herds, barns, dairy buildings, etc., once a month.

Better lighting, ventilation, drainage, and cleanliness of cow stables.

Whitewashing the interior of stables.

Eradication of tuberculosis from dairy herds.

Branding of condemned cows.

Cows not to be given swill feed, etc.

Cows to be regularly cleaned.

Pasturage for city cows.

Aeration of milk in pure air.

Prompt cooling of milk and holding it at a low temperature until final delivery.

Shipment of milk from farms promptly after milking.

Delivery of milk and cream in sealed packages (glass bottles or small cans) so as to avoid unnecessary contamination by city dust, etc.

Delivery of milk in cities at any hour of the day when it can be supplied in the best condition.

Restrictions upon the sale of milk in markets, candy stores, etc.

Delivery of milk from such stores in bottles only.

Mixing of herd milk to get an article of uniform composition.

Bottling of milk only at the dairy or place of general supply.

Daily sterilization of milk utensils.

More rigid inspections for preservatives in milk.

Chemical and bacteriological examinations of milk.

Standards for cream and skimmed milk.

The passage of no law that can not be reasonably well enforced.

More pay and allowances and greater authority for milk and dairy inspectors.

More severe penalties for violations of milk laws.

Publication of reports on inspection of dairies.

Education of milk producers by a liberal distribution of circulars, leaflets, etc., bearing upon their work.

TABLES SHOWING THE STATISTICS OF MILK SUPPLY AND SUPERVISION.

For the purpose of enabling comparison to be made between cities and towns of about the same size, such data as can be tabulated from the reports have been arranged in the four tables which follow.

TABLE I.—*Statistics of milk supply and supervision in all*

States and cities.	Population according to the 1900 census.	Average daily milk consumption.		Average daily skimmed milk consumption.	Average daily cream consumption.	Milk stores.	Milk wagons.	Farthest distance milk supplied.	Portion of milk shipped by rail.	Production of milk within city limits.			
		Total.	Per capita.							Herds.	Cows in herds.	Herds inspected past year.	
California:	*No.*	*Galls.*	*Pints.*	*Galls.*	*Galls.*	*No.*	*No.*	*Miles.*	*P.ct.*	*No.*	*No.*	*No*	
Los Angeles	102,479	4,500	0.85	......	150	......	112	20	5	25	500	25	*1*
San Francisco	342,782	25,000	.58	500	1,500	173	350	......	....	196	5,880	0	*2*
Colorado:													
Denver	133,859	12,110	.65	1,000	2,000	200	300	40	10	80	900	80	*3*
Connecticut:													
New Haven	108,027	8,750	[i].65	......	......	400	200	10	....	......	......	....	*4*
Dist. of Columbia:													
Washington	278,718	12,500	.36	......	......	114	150	92	....	136	1,127	125	*5*
Illinois:													
Chicago	1,698,575	169,465	[c].80	......	......	2,162	2,692	123	97	30	420	30	*6*
Indiana:													
Indianapolis	169,164	12,000	57	8,000	4,000	770	273	40	5	25	180	25	*7*
Kentucky:													
Louisville	204,731	10,000	.39	8,000	50	100	250	50	50	100	1,000	25	*8*
Louisiana:													
New Orleans	287,104	9,609	.27	200	75	17	410	83	14	410	6,686	440	*9*
Maryland:													
Baltimore	508,957	25,000	.39	5,000	4,000	2,530	525	200	....	539	3,314	539	*10*
Massachusetts:													
Boston	560,892	82,250	[d]1.17	......	......	2,900	[e]506	140	75	126	739	126	*11*
Fall River	104,863	6,000	.46	4	50	327	320	10	0	105	350	105	*12*
Worcester	118,421	16,500	[f]1.11	200	250	400	350	25	1	340	4,036	316	*13*
Michigan:													
Detroit	285,704	15,000	.42	2,000	700	700	230	......	....	50	250	25	*14*
Minnesota:													
Minneapolis	202,718	28,000	1.11	335	3,536	400	500	75	20	......	[g]1,300	92	*15*
St. Paul	163,065	12,000	.59	1,500	1,200	400	325	75	20	......	......	....	*16*
Missouri:													
Kansas City, including Kansas City, Kans	215,170	25,000	.93	......	......	400	420	75	20	40	700	40	*17*
St. Joseph	102,979	8,562	.66	4,290	100	30	125	50	12	68	1,000	12	*18*
St. Louis	575,238	26,375	.37	0	3,000	1,987	1,109	......	....	400(?)	8,000	350	*19*
Nebraska:													
Omaha	102,555	5,740	.45	200	140	146	150	75	33	89	2,000	89	*20*
New Jersey:													
Jersey City	206,433	12,000	.47	0	500	450	250	250	90(?)	30	275	30	*21*
Newark	246,070	16,000	.52	......	1,200	800	279	312	60	58	874	58	*22*
Paterson	105,171	8,000	.61	......	200	225	......	42	16	84	423	....	*23*

[a] L = Lactometer. B = Babcock test. G = Gravimetric analysis.

[b] Tu = Tubercle bacilli. Ty = Typhoid fever bacilli. P = Pus cells. Pa = Pathogenic bacteria.

[c] Portion used in manufacturing butterine.

[d] Large portion consumed by nonresidents for noon lunch.

the (38) cities of 100,000 or more population (Class I).

	Dairies beyond city limits supplying milk.		Retail price milk per quart.		"Model" dairies supplying milk.			Milk standard.		Milk inspection.		Examinations of milk samples past year.			
						Retail price per quart.						For composition.		For bacteria.	
	Total.	Inspected past year.	Summer.	Winter.	Number.	Summer.	Winter.	Total solids.	Fat.	Estimated annual cost.	Officials employed.	Number.	Methods.[a]	Number.	Kinds.[b]
	No.	*No.*	*Cts.*	*Cts.*		*Cts.*	*Cts.*	*P. ct.*	*P. ct.*	*Dolls.*	*No.*				
1	75	75	5	5	1	7½	7½	12	3.4	1,100	1	419	L. B. G.	......	
2	300	0	5–7	5–7	0	......	......	12	3.2	......	....	464	L. B. G.	3	Tu. Ty.
3	300	300	5–6¼	6¼–8½	....	......	......	12	3	1,200	2	2,200 600	B. G.	Few.	
4	......	12	6	7	6	6	7	11.5	3.5	......	....	74	L. B.	......	
5	630	205	6–8	6–8	2	10–12	10–12	12.5	3.5	......	3	413	L. B. G.	0	
6	4,000	11	5–7	6–7	2	7–12	7–12	12	3	10,000	7	19,053	L. B. G.	126	Tu.
7	250	204	5	6	....	......	......	12	3	1,000	1	850	L. B. G.	14	
8	100	25	5–6¼	5–6¼	4	6¼–7½	6¼–7½	12	3	......	3	475	G.	0	
9	69	27	7½	7½	3	10	10	13	3.5	......	....	1,141	L. B. G.	2	Tu.
10	1,500	220	5–10	5–10	3	8–10	8–10	12	3	2,300	3	900 31,803	B. G. L.	300	P. Tu.
11	......	....	5–8	5–8	20	5–8	5–8	13 12	3.7 3	13,000	6	15,000	L. B. G.	0	
12	240	240	5–6	6–7	5	7	7	12	3	1,250	1	257	B.	0	
13	568	....	5½	5½	25	7	8	......	......	1,000	3	1,400	L. B. G.	200	
14	500	....	5	6	3	7	8	12.5	3	1,000	2	1,219	L. B. G.	12	Tu. Ty.
15	......	99	5	5–6	....	......	......	13	3.5	5,000	5	3,022	B. G.	Few.	
16	......	....	5	6	0	......	......	13	3.5	2,000	....	500	L. B. G.	0	
17	240	200	5	5½	3	6	6	12	3	2,500	2	2,500	B. G.	125	Tu.
18	......	18	5	6¼	0	......	......	12	3	......	1	6	L.	0	
19	119	....	5–8	5–8	3	12½	12½	11.5	3	1,850	1	684	L. B.	72	Ty.
20	......	15	5	6	....	......	......	12	3	1,200	1	460	B.	......	
21	......	....	6–8	7–8	0	......	......	......	......	[h] S.	....	500	L. G.	0	
22	500	....	6	7	Few.	8–12	8–12	12	.....	2,000	3	283 3,508	L. B. G. L.	0	
23	......	0	6–8	6–8	2	10	12	......	......	......	....	0	......	......	

[e] There are 506 licenses, but some persons run several wagons on one license.

[f] Portion consumed by inhabitants of near-by towns and cities.

[g] Besides 1,200 cows kept by private families.

[h] State control.

[i] Tourists, etc., make average population 150,000.

TABLE I.—*Statistics of milk supply and supervision in all the*

States and cities.	Population according to the 1900 census.	Average daily milk consumption.		Average daily skimmed milk consumption.	Average daily cream consumption.	Milk stores.	Milk wagons.	Farthest distance milk supplied.	Portion of milk shipped by rail.	Production of milk within city limits.			
		Total.	Per capita.							Herds.	Cows in herds.	Herds inspected past year.	
New York:	*No.*	*Galls.*	*Pints.*	*Galls.*	*Galls.*	*No.*	*No.*	*Miles.*	*P.ct.*	*No.*	*No.*	*No.*	
Buffalo	352,387	31,000	0.70	10,000	......	1,200	529	......	....	22	340	22	24
New York	3,437,202	338,856	.78	0	4,000	12,000	4,000	350	85	5,500	23,200	560	25
Rochester	162,608	17,000	.83	......	......	75	275	45	67	6	90	6	26
Syracuse	108,374	10,200	.75	800	250	340	195	8	1	14	176	14	27
Ohio:													
Cincinnati	325,902	25,000	.61	......	......	200	200	100	25	40	1,400	40	28
Cleveland	381,768	21,490	.45	1,000	500	1,200	580	65	....	31	225	31	29
Columbus	125,560	6,397	.41	......	......	134	286	40	....	......	......	....	30
Toledo	131,822	9,650	.59	......	......	221	253	80	33	41	769	41	31
Pennsylvania:													
Allegheny	129,896	5,000	.31	......	......	160	400	150	67	38	500	38	32
Philadelphia	1,293,697	75,000	.46	......	......	1,500	2,000	200	75(?)	500	5,000	500	33
Pittsburg	321,616	30,000	.75	......	......	1,230	425	50	90	241	......	....	34
Scranton	102,026	7,000	.55	......	......	170	125	30	....	2	25	0	35
Rhode Island:													
Providence	175,597	22,000	[a]1.00	......	......	1,200	500	60	33	......	......	....	36
Tennessee:													
Memphis	102,320	6,400	.50	......	......	40	168	527	....	......	......	....	37
Wisconsin:													
Milwaukee	285,315	25,000	.70	......	600	500	600	72	25	117	643	70	38
Average of those reporting.	375,257	30,930	.61	2,152	1,273	968	550	105	38	297	2,260	124	....

[a] Portion used in manufacturing butterine.

(*38*) *cities of 100,000 or more population* (*Class I*)—Continued.

	Dairies beyond city limits supplying milk.		Retail price milk per quart.		"Model" dairies supplying milk			Milk standard.		Milk inspection.		Examinations of milk samples past year.			
						Retail price per quart.						For composition.		For bacteria.	
	Total.	Inspected past year.	Summer.	Winter.	Number.	Summer.	Winter.	Total solids.	Fat.	Estimated annual cost.	Officials employed.	Number.	Methods.	Number.	Kinds.
	No.	*No.*	*Cts.*	*Cts.*		*Cts.*	*Cts.*	*P. ct.*	*P. ct.*	*Dolls.*	*No.*				
24	656	....	6	6	Few.	7	7	12	3	2,000	3	64 1,022	B. G. L.	3	
25	3,500	....	6	8	Few.	12-15	12-15	12	3	....	12	78,341 1,313	L. B. G.	....	
26	200	175	5	6	10	6	8	12	3	4,000	2	204 4,254	G. L. B.	335	
27	216	216	5	5	40	5-8	5-8	......	.....	1,400	1	10,630 120	L. B. G.	0	
28	200	150	6	6	3	8	8	12	3.1	1,200	1	600	B.	0	
29	650	250	5	6	2	6	7	......	.....	3,000	4	6,666	B.	300	Pa.
30	191	....	6	6	.....	......	......	12 11.5	3 2.5	1,200	2	456	L. B.	Few.	Tu. Ty.
31	202	131	5	6	1	8	10	12 11.5	3	1,250	1	450	G.	14	Tu.
32	90	....	6	8	.....	......	......	......	.....	2,700	2	2,000	L. B. G.	180	Tu. Ty.
33	2,500	....	6	8	4(?)	......	......	12	3.5	9,580	10	95 47,023	L. G. L.	390	Ty. P.
34	......	....	6-8	8-10	4	10	10	......	.....	3,000	2	4,997	B. G.	0	
35	400	0	6	7	0	......	......	12.5	3.5	1,200	1	2,612	L. B.	0	
36	......	....	5-8	6-8	7	6-8	6-8	12	2.5	6,000	4	*b*3,178	B. G.	200	
37	188	153	6	6	1	8	8	12	3	1,200	2	1,083	B. G.	36	Tu.Ty.P.
38	......	0	5	5-6	0	......	......	12	3	1,500	....	....	B.	0	
....	686	114	5.8	6.5	.....	8.2	8.6	......	.....	2,953	3	6,834	....	77	

b For five months.

TABLE II.—*Statistics of milk supply and supervision in all of the (40)*

States and cities.	Population according to the 1900 census.	Average daily milk consumption.		Average daily skimmed milk consumption.	Average daily cream consumption.	Milk stores.	Milk wagons.	Farthest distance milk supplied.	Portion of milk shipped by rail.	Production of milk within city limits.			
		Total.	Per capita.							Herds.	Cows in herds.	Herds inspected past year.	
	No.	*Galls.*	*Pints.*	*Galls.*	*Galls.*	*No.*	*No.*	*Miles.*	*P.ct*	*No.*	*No.*	*No.*	
California:													
Oakland	66,960	4,500	0.54	100	75	45	80	40	....	45	3,500	45	*1*
Connecticut:													
Bridgeport	70,996	6,250	.70	0	250	200	250	75	8	8	......	....	*2*
Hartford	79,850	9,000	[c] .90	600	115	53	195	20	3	20	300	20	*3*
Delaware:													
Wilmington	76,508	3,756	.39	250	25	55	341	40	50	9	85	0	*4*
Georgia:													
Atlanta	89,872	[e] 1,500	.13	300	101	10	350	20	20	3	......	3	*5*
Savannah	54,244	3,000	.44	......	......	10	....	5	0	......	......	0	*6*
Illinois:													
Peoria	56,100	5,000	.71	500	450	45	80	50	4	23	446	23	*7*
Indiana:													
Evansville	59,007	2,500	.34	......	......	3	60	9	0	5	60	5	*8*
Iowa:													
Des Moines	62,139	5,000	.64	......	......	40	125	40	....	75	1,000	....	*9*
Kansas:													
Kansas City	51,418	[g] 3,000	.47	......	165	100	75	40	....	42	1,000	42	*10*
Maine:													
Portland	50,145	3,000	.48	......	......	200	75	48	75	19	134	....	*11*
Massachusetts:													
Cambridge	91,886	[h] 9,074	.79	202	116	410	156	100	53	76	234	76	*12*
Lawrence	62,559	6,000	.76	500	200	700	200	12	....	8	130	8	*13*
Lowell	94,969	7,700	.65	200	50	350	156	20	4	......	100	....	*14*
Lynn	68,513	6,000	.70	600	125	350	75	300	67	60	350	60	*15*
New Bedford	62,442	7,000	.90	......	......	201	170	20	....	20	700	20	*16*
Somerville	61,643	7,640	.99	400	500	300	185	175	87	2	62	2	*17*
Springfield	62,059	4,750	.61	......	......	103	133	14	0	20	[f] 130	....	*18*
Michigan:													
Grand Rapids	87,565	5,000	.46	500	200	51	228	100	5	......	1,000	....	*19*
Minnesota:													
Duluth	52,969	4,000	.60	100	225	45	95	155	33	100	1,100	100	*20*
New Hampshire:													
Manchester	56,987	4,000	.56	......	......	100	115	18	....	0	......	0	*21*
New Jersey:													
Camden	75,935	4,000	.42	125	100	128	75	30	(j)	0	......	0	*22*
Elizabeth	52,130	13,062	2.00	0	......	25	50	5	....	10	100	10	*23*
Hoboken	59,364	8,750	[k] 1.21	......	......	243	24	......	....	......	......	....	*24*
Trenton	73,307	4,500	.49	......	......	25	130	20	5	1	20	....	*25*

[a] S.=State control.

[b] L.=lactometer. G.=gravimetric analysis. B.=Babcock test.

[c] A portion is consumed by nonresidents.

[d] Many.

[e] Besides 2,500 gallons of buttermilk.

[f] Nearly all.

cities of over 50,000 and under 100,000 population (Class II).

	Dairies beyond city limits supplying milk.		Retail price milk per quart.		"Model" dairies supplying milk.			Milk standard.		Milk inspection.		Examinations of milk samples past year.			
						Retail price per quart.						For composition.		For bacteria.	
	Total.	Inspected past year.	Summer.	Winter.	Number.	Summer.	Winter.	Total solids.	Fat.	Estimated annual cost.[a]	Officials employed.	Number.	Methods.[b]	Number.	Kinds.
	No.	*No.*	*Cts.*	*Cts.*		*Cts.*	*Cts.*	*P. ct.*	*P. ct.*	*Dolls.*	*No.*				
1	35	35	5-10	5-10	0	......	......	......	3	1,200	1	250	B.	10	
2	......	....	7	8	0	......	......	......	.....	0	0	......	......	......	
3	171	35	6-7	7-8	(*d*)	6-10	7-10	12.3	3.5	500	1	651	L. B.	......	
4	200	200	6	8	0	......	......	12	3	1,500	2	125	L. G.	125	
5	350	(*f*)	5	6	Few.	7	9	......	......	......	2	1,250	G.	0	
6	15	0	10	10	3	10	10	......	.....	0	0	0	......	......	
7	78	73	5-6	5-7	0	......	......	12	3	1,500	2	770	B.	35	
8	54	54	6¼	6¼	1	6¼	6¼	......	.....	900	1	215	L. B. G.	0	
9	100	....	5	5	0	......	......	......	.....	S. 300	1	1,000	B.	0	
10	......	10	5	5	0	......	......	12	3	100+	2	0	......	0	
11	40	....	6	7	Few.	7	7	......	.....	0	0	0	......	0	
12	500	....	4-8	5-9	Few.	8	9	......	.....	1,500	2	3,367	B. G.	......	
13	......	....	6	6	0	......	......	......	.....	350	1	179	B.	......	
14	......	....	5	6	1	7	7	......	.....	2,329	2	2,972	B. G.	......	
15	800	....	4-7	4-7	Few.	7	7	......	.....	2,500	2	......	......	......	
16	......	....	6	6	0	......	......	......	.....	1,500	2	900	L.	0	
17	......	....	6	7	0	......	......	......	.....	500	1	575	B. G.	0	
18	420	....	6	6	0	......	......	......	.....	100	1	......	L. B.	......	
19	228	228	5	6	7	6-8	6-8	12.5	3	1,600	2	1,500	B. G.	0	
20	65	45	5	6	1	7	7	......	.....	S.	1	400	B.	0	
21	150	....	5	5-6	0	......	......	......	.....	300	1	140	L.	......	
22	113	0	8	8	0	......	......	......	.....	1,200	2	550	L. G.	0	
23	55	55	6	8	0	......	......	......	.....	S.	....	......	L.	0	
24	......	....	3-6	4-8	....	......	......	......	.....	0	....	......	......	......	
25	150	30	6	8	3	6	8	......	.....	S.	....	100	L. G.	0	

[g] 4,000 gallons in addition used by oleomargarine factories.

[h] Also large quantities of cream and skim milk used by bakers and ice-cream manufacturers.

[i] Besides 100 private cows.

[j] Almost all.

[k] Wholesalers and retailers report same milk.

TABLE II.—*Statistics of milk supply and supervision in all of the (40)*

States and cities.	Population according to the 1900 census.	Average daily milk consumption.		Average daily skimmed milk consumption.	Average daily cream consumption.	Milk stores.	Milk wagons.	Farthest distance milk supplied.	Portion of milk shipped by rail.	Production of milk within city limits.			
		Total.	Per capita.							Herds.	Cows in herds.	Herds inspected past year.	
New York:	*No.*	*Galls.*	*Pints.*	*Galls.*	*Galls.*	*No.*	*No.*	*Miles.*	*P. ct.*	*No.*	*No.*	*No.*	
Albany	94,151	8,022	0.68	1,468	213	105	188	62	25	25	366	....	*26*
Troy (and Lansingburg).	73,246	6,000	.66	750	......	......	120	50	12	......	.....	....	*27*
Utica	56,383	5,000	.71	300	150	60	210	10	0	5	50	5	*28*
Ohio:													
Dayton	85,333	6,500	.61	200	150	300	100	20	50	15	194	15	*29*
Oregon:													
Portland	90,426	7,500	.66	......	......	25	150	8	0	45	240	20	*30*
Pennsylvania:													
Erie	52,733	3,600	.54	250	150	123	78	15	0	3	25	3	*31*
Harrisburg	50,167	2,500	.40	1,000	125	12	75	15	8	2	20	....	*32*
Reading	78,961	4,200	.43	1,400	175	20	145	8	0	0	......	0	*33*
Wilkesbarre	51,721	2,890	.45	......	......	40	60	130	50	0	......	0	*34*
South Carolina:													
Charleston	55,807	720	[a].10	8	1	......	6	5	0	......	......	....	*35*
Tennessee:													
Nashville	80,865	6,802	.67	......	......	13	198	18	....	0	......	0	*36*
Texas:													
San Antonio	53,321	......	......	......	......	......	......	......	......	......	......	....	*37*
Utah:													
Salt Lake City	53,531	2,300	.34	......	......	20	57	35	....	25	[b]250	....	*38*
Virginia:													
Richmond	85,050	4,000	.38	......	100	100	150	35	5	0	......	0	*39*
Washington:													
Seattle	80,671	9,200	.91	400	700	142	87	44	66	21	400	21	*40*
Average of those reporting.	68,048	5,313	.63	423	186	128	133	48	25	21	444	18	.....

[a] Large number of private cows kept and no record of milk sold from these.

[b] 1,000 gallons are produced by private cows.

cities of over 50,000 and under 100,000 population (Class II)—Continued.

	Dairies beyond city limits supplying milk.		Retail price milk per quart.		"Model" dairies supplying milk.			Milk standard.		Milk inspection.		Examinations of milk supplies past year.			
						Retail price per quart.						For composition.		For bacteria.	
	Total.	Inspected past year.	Summer.	Winter.	Number.	Summer.	Winter.	Total solids.	Fat.	Estimated annual cost.	Officials employed.	Number.	Methods.	Number.	Kinds.
	No.	*No.*	*Cts.*	*Cts.*		*Cts.*	*Cts.*	*P. ct.*	*P. ct.*	*Dolls.*	*No.*				
26	150	....	6	6	0	......	......	......	.....	S.	....	12,000	L. B. G.	Few.	
27	200	....	6	6	0	......	......	......	.....	S.	....	....	....	......	
28	125	125	5	6	3	5	6	12	3	600	1	50	L. B. G.	1	
29	50	37	5-6	5-6	3	7	7	......	.....	0	1	....	....	5	
30	......	15	5	5-7½	0	......	......	......	.....	S.	....	75	B. G.	0	
31	100	100	5	5	0	......	......	......	.....	......	....	1,758	L. B. G.	0	
32	90	....	5-6	6	1	7	7	......	.....	0	0	....	....	0	
33	145	....	6	6	.....	......	......	......	.....	185	1	121	L.	0	
34	53	53	6	8	Few.	6	8	......	.....	......	1	350	L. B.	......	
35	......	1	8	8	0	......	......	......	.....	0	....	0	....	27	
36	193	0	.....	.....	.....	......	......	12.5	.....	......	....	2,570	G.	0	
37	......	0	8	10	1	......	......	......	.....	0	0	0	....	0	
38	......	....	5	5	2	5	5	12	3	......	0	55	L. B. G.	......	
39	150	0	6	6	0	......	......	......	.....	0	0	0	....	0	
40	76	76	5	7	0	......	......	12	3	1,200	1	2,400 117	B. G.	0	
....	167	64	5.9	6.6	.....	6.9	7.4	......	.....	685	1	1,076	....	7	

TABLE III.—*Statistics of milk supply and supervision in (83)*

States and cities.	Population according to the 1900 census.	Average daily milk consumption.		Average daily skimmed milk consumption.	Average daily cream consumption.	Milk stores.	Milk wagons.	Farthest distance milk supplied.	Portion of milk shipped by rail.	Production of milk within city limits.			
		Total.	Per capita.							Herds.	Cows.	Herds inspected past year.	
Alabama:	*No.*	*Galls.*	*Pints.*	*Galls.*	*Galls.*	*No.*	*No.*	*Miles.*	*P.ct*	*No.*	*No.*	*No.*	
Birmingham	38,415	2,000	0.42	......	......	2	100	50	10	20	300	20	*1*
Mobile	38,469	......	......	......	......	8	35	6	0	......	......	....	*2*
Montgomery	30,346	[d]540	.14	20	25	0	25	8	0	1	14	1	*3*
Arkansas:													
Little Rock	38,307	1,300	.26	......	......	Few.	40	12	....	25	250	....	*4*
California:													
Sacramento	29,282	3,000	.82	......	50	15	55	7	....	0	......	....	*5*
Colorado:													
Pueblo	28,157	5,000	[e]1.42	350	200	10	40	20	....	20	650	20	*6*
Connecticut:													
New Britain	25,998	1,500	.46	50	10	0	30	......	....	1	......	....	*7*
Waterbury	45,859	5,000	.87	250	250	130	125	20	5	200	3,000	200	*8*
Florida:													
Jacksonville	28,429	1,200	.34	......	......	75	35	4	....	0	......	....	*9*
Georgia:													
Augusta	39,411	[d]600	.12	......	......	1	30	6	....	0	......	....	*10*
Hawaii:													
Honolulu	39,306	[d]1,000	.20	0	12	3	30	6	....	37	900	10	*11*
Illinois:													
East St. Louis	29,655	......	......	......	......	......	......	......	....	......	......	....	*12*
Joliet	29,353	2,400	.65	0	15	8	55	5	0	0	......	....	*13*
Quincy	36,252	1,500	.33	1,000	500	30	20	5	....	......	......	....	*14*
Rockford [h]	31,051	......	......	......	......	......	......	......	....	......	......	....	*15*
Springfield	34,159	2,500	.59	......	......	4	48	20	6	7	63	7	*16*
Indiana:													
Fort Wayne	45,115	2,480	.44	......	......	15	106	8	0	175	297	175	*17*
South Bend	35,999	1,000	.22	......	......	0	35	15	2	0	......	....	*18*
Terre Haute	36,673	1,000	.22	40	30	9	25	30	....	......	......	....	*19*
Iowa:													
Cedar Rapids	25,656	1,500	.47	400	200	35	40	12	0	8	200	....	*20*
Council Bluffs	25,802	1,600	.49	50	250	6	31	7	33	22	300	0	*21*
Davenport	35,254	1,400	.32	500	150	3	64	6	0	14	239	14	*22*
Dubuque	36,297	1,425	.31	......	150	12	45	10	0	......	......	....	*23*
Sioux City	33,111	4,500	[a]1.09	......	......	10	46	6	0	41	610	0	*24*
Kansas:													
Topeka	33,608	2,000	.48	50	80	20	50	10	0	4	60	4	*25*
Kentucky:													
Covington	42,938	3,500	.65	......	......	140	36	9	....	0	......	....	*26*
Lexington	26,369	2,000	.61	258	178	10	48	7	0	......	......	....	*27*
Newport	28,301	......	......	......	......	......	......	......	....	......	......	....	*28*

[a] S. = State control.

[b] L. = Lactometer. B. = Babcock test. G. = Gravimetric analysis.

[c] Tu. = Tubercle bacilli. Ty. = Typhoid fever bacilli. P. = Pus cells. Pa. = Pathogenic bacteria. Dip. = Diphtheria.

cities of over 25,000 and under 50,000 population (*Class III*).

	Dairies beyond city limits supplying milk.		Retail price milk per quart.		"Model" dairies supplying milk.			Milk standard.		Milk inspection.		Examinations of milk samples past year.			
						Retail price per quart.						For composition.		For bacteria.	
	Total.	Inspected past year.	Summer.	Winter.	Number.	Summer.	Winter.	Total solids.	Fat.	Estimated annual cost.[a]	Officials employed.	Number.	Methods.[b]	Number.	Kinds.[c]
	No.	*No.*	*Cts.*	*Cts.*		*Cts.*	*Cts.*	*P. ct.*	*P. ct.*	*Dolls.*	*No.*				
1	90	40	8	9	2	9	10	12.5	3	1,000	1	500	L. B. G.	......	
2	35	0	10	10	0	......	......	......	.....	0	0	....	....	......	
3	19	19	10	10	0	......	......	12.5	3	1,000	1	864	L. B. G.	Several.	Tu.
4	40	....	.....	.....	.....	......	......	......	.....	0	0	....	....	......	
5	36	36	7	7	.....	......	......	12	3.2	1,300	1	1,200	B.	......	
6	17(?)	17	6	7	.....	......	......	......	.....	1,000	1	*f* 344	L. B. G.	......	
7	30	....	6–7	7–8	0	......	......	......	.....	0	0	....	....	......	
8	250	250	5	7	0	......	......	......	.....	1,000	1	1,000	B. L. G.	2	Ty.
9	35	35	10	10	0	......	......	12	3	....	....	185	L. B.	......	
10	20	0	4–6½	6½–7¼	0	......	......	......	.....	0	0	0	....	0	
11	......	....	10–15	10–15	0	......	......	......	.....	1,660	2	*f* 700	L. B. G.	0	
12	......	....	.....	.....	.....	......	......	......	.....	....	0	....	....	......	
13	40	40	5	5	0	......	......	......	3	....	....	300	L.	......	
14	20	....	5	5	.....	......	......	......	.....	0	0	....	....	......	
15	......	....	.....	.....	.....	......	......	......	.....	0	0	....	....	......	
16	28	13	.....	.....	.....	......	......	12	3	....	....	389	L. B.	0	
17	84	84	.....	.....	.....	......	......	12	3.5	....	....	700	B.	0	
18	25	0	5	6	0	......	......	......	.....	....	....	28	Preserv.	0	
19	34	34	5	5	1	10	10	......	.....	1,200	1	500	B. preserv.	......	
20	......	0	4–5	4–5	0	......	......	......	3	S. 150	....	....	B.	0	
21	5(?)	0	5	6	0	......	......	......	.....	S.	1	....	B.	0	
22	52	52	5	5	.....	......	......	......	.....	600	2	1,000 5	B. G.	0	
23	40	0	5	5	0	......	......	......	.....	S. 144	1	5,000	B.	......	
24	......	....	5	6	0	......	......	......	.....	S. 144	1	720	B.	0	
25	150	....	5	5–6¼	1	8¼	......	12	3	1,000	1	400	B.	0	
26	31	31	6–8	6–8	1	8	8	......	.....	....	....	372	L. B.	0	
27	39	....	5	6½	.....	......	......	......	.....	0	0	....	....	......	
28	......	....	.....	.....	.....	......	......	......	.....	....	....	....	....	......	

[d] Large number of private cows kept and milk sold; no record.

[e] Claim population is 47,955.

[f] Samples examined in 9 months.

[g] Claim population is over 35,000.

[h] No inspector and no records; can get no facts.

TABLE III.—*Statistics of milk supply and supervision in (83)*

States and cities.	Population according to the 1900 census.	Average daily milk consumption.		Average daily skimmed milk consumption.	Average daily cream consumption.	Milk stores.	Milk wagons.	Farthest distance milk supplied.	Portion of milk shipped by rail.	Production of milk within city limits.			
		Total.	Per capita.							Herds.	Cows.	Herds inspected past year.	
Massachusetts:	*No.*	*Galls.*	*Pints.*	*Galls.*	*Galls.*	*No.*	*No.*	*Miles.*	*P.ct*	*No.*	*No.*	*No.*	
Brockton	40,063	3,200	0.64	50	40	150	150	16	0	41	584	41	*29*
Chelsea	34,072	3,800	.89	100	40	179	46	......	....	15	140	15	*30*
Fitchburg........	31,531	4,541	1.15	......	45	99	126	12	....	34	404	34	*31*
Gloucester	26,121	2,300	.70	0	125	124	88	16	....	50	700	50	*32*
Haverhill	37,175	3,290	.71	......	......	120	100	10	....	120	1,000	120	*33*
Holyoke	45,712	4,373	.77	488	63	172	136	16	....	78	858	78	*34*
Malden	33,664	3,000	.71	......	......	95	45	75	50	25	188	(*a*)	*35*
Newton	33,587	5,275	1.25	......	32	140	130	50	½	41	1,170	41	*36*
Salem	35,956	4,200	.93	......	33	80	61	12	....	6	185	....	*37*
Taunton	31,036	2,532	.65	......	......	26	135	9	0	77	810	77	*38*
Michigan:													
Bay City	27,628	3,000	.87	......	......	8	28	6	....	8	40	3	*39*
Jackson City.....	25,180	1,745	.55	......	......	60	52	6½	....	8	55	8	*40*
Saginaw	42,345	......	......	......	......	......	......	......	....	......	......	....	*41*
Missouri:													
Joplin............	26,023	3,500	.56	50	25	21	32	20	....	1	25	....	*42*
Montana:													
Butte	30,470	7,000	.75	1,000	100	12	35	12	4	0	......	....	*43*
Nebraska:													
Lincoln	40,169	3,000	.60	2,000	200	25	(?)	6	0	0	......	....	*44*
South Omaha	26,001	1,108	.34	30	60	2	27	30	....	4	71	4	*45*
New Jersey:													
Atlantic City	27,838	......	......	......	......	30	50	50	100	0	......	....	*46*
Bayonne.........	32,772	1,800	.50	......	......	130	35	40	....	4	125	4	*47*
Passaic...........	27,777	......	......	......	......	......	......	100	70	48	122	43	*48*
New York:													
Auburn	30,345	3,000	.79	50	50	4	60	6	0	5	230	....	*49*
Binghamton	39,647	2,520	.51	215	250	50	72	10	....	0	......	....	*50*
Elmira	35,672	5,000	1.12	......	......	25	100	6	....	8	170	....	*51*
Schenectady	31,682	2,000	.51	......	......	8	34	18	13	3	20	0	*52*
Yonkers	47,931	4,000	.67	0	40	208	56	85	50	28	648	28	*53*
Ohio:													
Akron............	42,728	3,000	.56	......	100	75	88	20	13	2	25	2	*54*
Canton...........	30,667	2,000	.52	......	......	......	70	10	....	3	41	3	*55*
Springfield.......	38,253	......	......	......	......	......	......	8	....	......	......	....	*56*
Youngstown	44,885	2,000	.36	......	......	45	60	15	....	0	......	....	*57*
Pennsylvania:													
Allentown	35,416	......	......	......	......	......	......	......	....	......	......	....	*58*
Altoona	38,973	3,500	.72	......	......	25	40	15	50	2	20	....	*59*

[a] Nearly all.

cities of over 25,000 and under 50,000 population (*Class III*)—Continued.

	Dairies beyond city limits supplying milk.		Retail price milk per quart.		"Model" dairies supplying milk.			Milk standard.		Milk inspection.		Examination of milk samples past year.			
						Retail price per quart.						For composition.		For bacteria.	
	Total.	Inspected past year.	Summer.	Winter.	Number.	Summer.	Winter.	Total solids.	Fat.	Estimated annual cost.	Officials employed.	Number.	Methods.	Number.	Kinds.
	No.	*No.*	*Cts.*	*Cts.*		*Cts.*	*Cts.*	*P. ct.*	*P. ct.*	*Dolls.*	*No.*				
29	20	20	6	6	1	6	6	......	.....	100	....	25	....	......	
30	......	....	4–7	5–8	0	......	......	......	.....	225	....	1,058	Lacto-scope.	0	
31	58	0	6	6	Few.	6	6	12	3	300(?)	1	25	L.	4	Ty. Dip.
32	......	....	6–7	6–7	.....	......	......	......	.....	150	1	0	....	......	
33	125	39	6	6	Few.	6	6	......	.....	150	....	275	L. B.	0	
34	300	....	5	6	Few.	7	8	......	.....	500	2	260	B.	0	
35	......	....	6	7	0	......	......	......	.....	300	1	475	G.	0	
36	63	....	7–8	7–8	1	8	8	......	.....	601.39	1	1,562	L. G.	......	Tu. Ty.
37	20	....	6–7	7–8	Few.	7–8	7–8	......	.....	S.	....	....	....	......	
38	......	....	6	6	0	......	......	......	.....	50	1	7	L.	0	
39	27	27	.....	.....	.....	......	......	12.5	3	....	....	[b]168	B.	0	
40	59	59	5	5	.....	......	......	......	.....	....	1	220	B. G.	0	
41	......	....	.....	.....	.....	......	......	......	.....	....	....	....	....	......	
42	22	....	5	5	5	5	5	......	.....	S.	1	0	....	......	
43	35	35	10	10	.....	......	......	......	.....	....	1	350	B.	0	
44	25	0	7	8	4	7	8	......	.....	0	....	0	....	......	
45	22	22	5–6	6	2	6	6	12	3	1,000	1	411	L. B. G.	0	
46	......	....	8	8	Few.	8	8	......	.....	S.	....	....	....	......	
47	......	....	.....	.....	.....	......	......	12	3	....	....	0	....	......	
48	......	0	5–8	5–8	1	......	......	......	.....	....	1	....	L.	0	
49	50	....	5	5	.....	......	......	......	.....	....	....	160	B.	0	
50	......	....	5	5	Few.	5–6	5–6	......	.....	0	0	....	....	6	
51	150	150	5	5	4	5	5	......	.....	....	1	....	L.	0	
52	......	0	5	6	0	......	......	......	.....	....	....	500	L.	0	
53	54	6	5–7	6–7	3	8–10	8–10	12	3	2,500	2	123	G.	43	P.
54	60	54	5	6	0	......	......	......	.....	300	1	580	L. and lacto-scope.	0	
55	......	....	5	5	.....	......	......	......	.....	700	2	....	L.	......	
56	......	....	5–6	5–6	2	6	6	......	.....	....	0	....	....	......	
57	40	0	6	8	Few.	6	8	......	.....	100	1	109	B.	12	
58	......	....	6	6	.....	......	......	......	.....	....	....	40	....	......	
59	......	....	6	7	.....	......	......	......	.....	S.	....	36	....	0	

[b] Samples examined in 9 months.

TABLE III.—*Statistics of milk supply and supervision in (83)*

States and cities.	Population according to the 1900 census.	Average daily milk consumption.		Average daily skimmed milk consumption.	Average daily cream consumption.	Milk stores.	Milk wagons.	Farthest distance milk supplied.	Portion of milk shipped by rail.	Production of milk within city limits.			
		Total.	Per capita.							Herds.	Cows.	Herds inspected past year.	
Pennsylvania—Ctd	No.	*Galls.*	*Pints.*	*Galls.*	*Galls.*	*No.*	*No.*	*Miles.*	*P.ct*	*No.*	*No.*	*No.*	
Chester	33,988	1,625	0.38	600	......	28	59	10	6	......	......	....	*60*
Easton	25,238	......	......	......	......	......	......	......	....	......	......	....	*61*
Johnstown	35,936	......	......	......	......	......	......	......	....	......	......	....	*62*
Lancaster	41,459	1,800	.35	......	50	12	96	14	3	28	58	28	*63*
McKeesport	34,227	2,000	.47	......	......	......	50	5	....	15	30	....	*64*
Newcastle	28,339	700	.20	150	150	75	75	7	0	0	......	....	*65*
Williamsport	28,757	875	.24	......	......	14	90	50	14	4	25	4	*66*
York	33,708	1,350	.32	150	25	25	40	8	0	0	......	....	*67*
Rhode Island:													
Pawtucket	39,231	2,955	.60	75	......	80	125	5	2	0	......	....	*68*
Woonsocket[a]	28,204	......	......	......	......	......	......	......	....	......	......	....	*69*
Tennessee:													
Chattanooga[a]	30,154	......	......	......	......	......	......	......	....	......	......	....	*70*
Knoxville	32,637	......	......	......	......	......	......	......	....	......	......	....	*71*
Texas:													
Dallas	42,638	5,250	.98	......	......	3	175	8	0	0	......	....	*72*
Fort Worth[a]	26,688	......	......	......	......	......	......	......	....	......	......	....	*73*
Galveston[a]	37,789	......	......	......	......	......	......	29	10	10	50	8	*74*
Houston	44,633	3,800	.68	100	200	3	109	6	0	19	269	19	*75*
Virginia:													
Norfolk[a]	46,624	......	......	......	......	......	......	......	....	......	......	....	*76*
Washington:													
Spokane	36,848	2,500	.54	......	200	8	45	50	....	6	200	6	*77*
Tacoma[a]	37,714	......	......	......	......	......	......	......	....	......	......	....	*78*
West Virginia:													
Wheeling	38,878	4,000	.82	......	400	140	120	30	33	10	100	....	*79*
Wisconsin:													
La Crosse	28,895	1,000	.28	100	100	50	30	2	0	......	......	....	*80*
Oshkosh	28,284	......	......	......	......	......	......	......	....	......	......	....	*81*
Racine	29,102	1,800	.49	100	50	20	40	8	0	0	......	....	*82*
Superior	31,091	......	......	......	......	2	40	140	....	27	400	27	*83*
Average of those reporting.	34,216	2,608	.58	265	118	46	64	20	12	21	355	31	....

[a] No inspectors and no records; can get no facts.

cities of over 25,000 and under 50,000 population (*Class III*).—Continued.

	Dairies beyond city limits supplying milk.		Retail price milk per quart.		"Model" dairies supplying milk.			Milk standard.		Milk inspection.		Examinations of milk samples past year.			
						Retail price per quart.						For composition.		For bacteria.	
	Total.	Inspected past year.	Summer.	Winter.	Number.	Summer.	Winter.	Total solids.	Fat.	Estimated annual cost.	Officials employed.	Number.	Methods.	Number.	Kinds.
	No.	*No.*	*Cts.*	*Cts.*		*Cts.*	*Cts.*	*P. ct.*	*P. ct.*	*Dolls.*	*No.*				
60	70	....	6	8	.....	.....	.....	.....	.....	......	0	......	......	.....	
61	.....	....	.....	.....	.....	.....	.....	.....	.....	......	....	......	......	.....	
62	.....	....	.....	.....	.....	.....	.....	.....	.....	......	....	......	......	.....	
63	145	80	5–6	5–6	10	5–6	5–6	.....	.....	8	0	505	L. B.	.....	
64	12	....	.....	.....	.....	.....	.....	.....	.....	......	....	0	......	0	
65	75	0	6	7	.....	.....	.....	0	.....	0	0	0	......	0	
66	127	127	5	6	3	5	6	.....	.....	......	1	73	L. Cr. gauge.	0	
67	28	0	5	5	0	.....	.....	.....	.....	0	0	0	......	0	
68	200	1	5–6	6–7	2	7	7	.....	.....	400	1	300	L. G.	0	
69	.....	....	.....	.....	.....	.....	.....	.....	.....	......	....	......	......	.....	
70	.....	....	.....	.....	.....	.....	.....	.....	.....	......	0	......	......	.....	
71	.....	....	.....	.....	.....	.....	.....	.....	.....	......	....	......	......	.....	
72	150	150	4–5	4–5	.....	.....	.....	.....	.....	......	....	......	L.	.....	
73	.....	....	.....	.....	.....	.....	.....	.....	.....	......	0	......	......	.....	
74	.....	0	15	15	.....	.....	.....	.....	.....	0	0	0	......	0	
75	128	128	5	5	0	.....	.....	12	3.2	960	1	4,775	L. B.	0	
76	.....	....	.....	.....	.....	.....	.....	.....	.....	0	0	......	......	.....	
77	.....	0	6	8	0	.....	.....	.....	.....	......	....	650	B.	.....	
78	.....	....	.....	.....	.....	.....	.....	.....	.....	......	....	206	B.	.....	
79	125	....	6	8	0	.....	.....	.....	.....	......	0	......	......	.....	
80	16	....	5	5	1	6	6	.....	.....	0	0	......	......	.....	
81	.....	....	.....	.....	.....	.....	.....	.....	.....	......	....	......	......	.....	
82	50	0	5	5	.....	.....	.....	.....	.....	0	....	10	L. B.	0	
83	.....	....	.....	.....	.....	.....	.....	.....	.....	......	....	......	......	.....	
....	65	37	6.2	6.7	.....	6.8	7	.....	.....	421	1	521	......	2	

TABLE IV.—*Statistics of milk supply and supervision in (39)*

States and cities.	Population according to the 1900 census.	Average daily milk consumption.		Average daily skimmed milk consumption.	Average daily cream consumption.	Milk stores.	Milk wagons.	Farthest distance milk supplied.	Portion of milk shipped by rail.	Production of milk within city limits.			
		Total.	Per capita.							Herds.	Cows in herds.	Herds inspected past year.	
California:	*No.*	*Galls.*	*Pints.*	*Galls.*	*Galls.*	*No.*	*No.*	*Miles.*	*P.ct.*	*No.*	*No.*	*No.*	
Alameda	16,464	1,760	0.86	50	100	21	38	45	9	11	62	11	*1*
San Jose	21,500	2,512	[d].93	......	......	40	100	7	0	3	40	3	*2*
Colorado:													
Colorado Springs	21,085	1,800	.68	300	80	19	28	14	....	1	60	1	*3*
Trinidad	5,345	500	.75	......	......	0	10	3	0	0	......	....	*4*
Illinois:													
Aurora	24,147	1,500	.50	100	50	14	43	8	0	2	40	2	*5*
Evanston	19,259	1,500	.62	......	......	10	40	75	35	7	400	7	*6*
Moline	17,248	577	.27	......	......	1	34	10	....	1	30	....	*7*
Ottawa	10,588	600	.45	......	......	0	15	4	....	3	25	3	*8*
Indiana:													
Richmond	18,226	1,250	.55	......	......	15	39	6	....	4	45	4	*9*
Iowa:													
Burlington	23,201	1,600	.55	......	......	1	44	20	....	50	1,200	35	*10*
Clinton	22,698	1,000	.35	......	60	10	30	10	....	......	......	....	*11*
Keokuk	14,641	500	.27	30	50	20	16	4	0	......	......	....	*12*
Marshalltown	11,544	800	.55	100	20	1	14	3	....	2	35	....	*13*
Ottumwa	18,197	606	[f].27	15	12	1	18	10	8	1	[g]12	0	*14*
Maine:													
Belfast	4,615	300	.52	20	5	6	12	8	0	5	125	....	*15*
Lewiston	23,761	1,800	.61	......	......	10	75	5	....	25	......	15	*16*
Waterville	9,477	800	.68	100	50	15	39	8	0	8	75	8	*17*
Massachusetts:													
Melrose	12,962	800	.49	25	20	49	69	10	5	40	150	....	*18*
North Adams	24,200	2,000	.66	75	25	10	50	9	0	27	377	27	*19*
North Attleboro	7,253	885	.98	......	......	6	34	4	0	24	275	24	*20*
Wakefield	9,290	800	.68	......	......	93	54	35	12	83	343	83	*21*
Woburn	14,254	1,032	.58	......	......	16	30	5	....	......	......	....	*22*
Michigan:													
Battlecreek	18,563	1,400	.60	......	......	4	26	9	....	6	......	6	*23*
Lansing	16,485	1,000	.49	100	25	3	22	4	....	3	32	3	*24*
New Jersey:													
Montclair	13,962	860	.49	......	......	12	32	400	20	4	35	4	*25*
New Brunswick	20,006	1,250	.50	......	......	30	30	6	....	5	70	2	*26*
New York:													
Lockport	16,581	900	.43	25	20	30	24	6	0	2	14	2	*27*
Mount Vernon	21,228	3,000	[h]1.18	0	350	15	60	75	33	10	100	10	*28*
Rome	15,343	1,000	.52	......	......	4	26	6	....	3	65	3	*29*
Watertown	21,696	2,400	.88	750	150	15	40	7	0	14	......	14	*30*

[a] S=State control.

[b] L=Lactometer. B=Babcock test. G=Gravimetric analysis.

[c] Tu=Tubercle bacilli. Ty=Typhoid bacilli. B'd corp.=blood corpuscles.

[d] 3,768 gallons brought to city daily, but about one-third goes to suburbs not included in the population of San José.

cities and towns of less than 25,000 population (Class IV).

	Dairies beyond city limits supplying milk.		Retail price milk per quart.		"Model" dairies supplying milk.			Milk standard.		Milk inspection.		Examinations of milk samples past year.			
						Retail price per quart.						For composition.		For bacteria.	
	Total.	Inspected past year.	Summer.	Winter.	Number.	Summer.	Winter.	Total solids.	Fat.	Estimated annual cost.[a]	Officials employed.	Number.	Methods.[b]	Number.	Kinds.[c]
	No.	No.	Cts.	Cts.		Cts.	Cts.	P. ct.	P. ct.	Dolls.	No.				
1	23	23	6¼	6¼	5	7½	8⅓	12.5	.....	1,200	1	925	L. B. G.	20	Bd. corp.
2	127	127	5	5	Few.	5	5	13	3¼	600	1	....	B.	0	
3	17	8	[e] P 5–8⅓	[e] P 5–8⅓	3	6¼	6¼	12	3	....	1	175	G.	3	Ty. Tu.
4	......	....	6⅔	6⅔	0	......	......	12	3	....	....	8	B. L. G.	0	
5	100	0	5	5	1	12	12	12	3	300	1	314	B. L.	15	Tu.
6	37	25	6	7–10	2	8	10	13	3	....	2	40	B. L. G.	0	
7	30	24	5	5	0	......	......	......	.....	....	....	332	B.	......	
8	13	11	5	6	0	......	......	......	.....	400	1	13	B. L.	0	
9	36	36	5	5	Few.	5	5	......	.....	150	1	38	B.	......	
10	12	0	5	6	0	......	......	......	.....	S.	....	600	B.	0	
11	30	....	5	5	0	......	......	.....	.....	S.	....	4,000	B.	......	
12	......	....	5	6¼	6	......	......	......	.....	S. 126	....	432	B.	0	
13	12	....	4–5	5–6	0	......	......	......	.....	S. 110	....	500	B.	......	
14	20	1	5	6	0	......	......	......	.....	S.	....	576	B.	1	Ty.
15	30	30	5	6	0	.....	......	......	.....	50	1	150	B. L. G.	0	
16	50	10	6	6	0	......	......	......	.....	200	1	300	B. L. G.	0	
17	39	39	5	6	4	5	6	......	.....	100	1	160	B. L.	0	
18	25	....	5–7	5–7	6	7	7	......	.....	100	1	36	L. G.	0	
19	75	75	5	6	Few.	5	6	......	.....	100	2	300	B.	0	
20	8	....	6	6	0	......	......	......	.....	200	1	150	B.	0	
21	......	....	6	6	Few.	7	7	......	.....	150	....	154	B. G.	0	
22	......	....	6	6	0	......	......	......	.....	100	....	25	L. G.	......	
23	70	70	5	5	.....	......	......	12.5	3	130	1	560	B. L.	......	
24	45	45	5	5	.....	......	......	......	.....	900	1	41	B. L.	4	Tu.
25	24	24	7–12	7–12	6	8–12	8–12	......	.....	300	2	166	B. L. G.	166	
26	55	....	4–6	5–8	1	6	8	......	.....	S.	....	3,500	B.	......	
27	22	12	5	6	0	......	......	......	.....	S.	....	40 1,000	B. L.	0	
28	90	90	7–15	8–15	4	8–15	8–15	12	3	500	....	40	L. B. G.	275	Ty.
29	36	36	4	5	0	......	......	......	.....	400	1	106	L. B.	......	
30	37	37	5	5	.....	......	......	......	.....	750	2	850	L. B. G.	0	

[e] Pasteurized.

[f] Large number of people keep private cows, and some sell milk to neighbors.

[g] There are also about 200 cows kept by private families.

[h] Large amount used in institutions, population of which is not counted in the city.

TABLE IV.—*Statistics of milk supply and supervision in (39)*

States and cities.	Population according to the 1900 census.	Average daily milk consumption.		Average daily skimmed milk consumption.	Average daily cream consumption.	Milk stores.	Milk wagons.	Farthest distance milk supplied.	Portion of milk shipped by rail.	Production of milk within city limits.			
		Total.	Per capita.							Herds.	Cows in herds.	Herds inspected past year.	
	No.	*Galls.*	*Pints.*	*Galls.*	*Galls.*	*No.*	*No.*	*Miles.*	*P.ct*	*No.*	*No.*	*No.*	
Ohio:													
Fostoria	7,730	400	.41	25	10	10	8	3	....	1	125	1	*31*
Hamilton	23,914	1,027	.34	......	......	46	32	6	0	21	73	13	*32*
Warren	8,529	645	.60	20	20	1	11	15	3	1	24	1	*33*
Pennsylvania:													
Lebanon	17,628	1,500	.68	200	300	....	45	8	0	15	60	12	*34*
Meadville	10,291	875	.68	......	......	2	30	4	....	......	......	....	*35*
Phoenixville	9,196	725	.63	30	10	3	37	5	....	7	60	....	*36*
Wisconsin:													
Green Bay	18,684	600	[a].26	......	60	1	28	8	0	8	120	8	*37*
Marinette	16,195	464	[a].23	......	12	3	23	96	10	8	[b]105	8	*38*
Waukesha	7,419	395	.43	......	......	....	15	3	0	2	40	....	*39*
Average of those reporting.	15,728	1,112	.57	109	68	15	34	25	6	12	136	11	....

[a] Large number of people keep private cows, and some sell milk to neighbors.

cities and towns of less than 25,000 population (*Class IV*)—Continued.

	Dairies beyond city limits supplying milk.		Retail price milk per quart.		"Model" dairies supplying milk.			Milk standard.		Milk inspection.		Examinations of milk samples past year.			
						Retail price per quart.						For composition.		For bacteria.	
	Total.	Inspected past year.	Summer.	Winter.	Number.	Summer.	Winter.	Total solids.	Fat.	Estimated annual cost.	Officials employed.	Number.	Methods.	Number.	Kinds.
	No.	*No.*	*Cts.*	*Cts.*		*Cts.*	*Cts.*	*P. ct.*	*P. ct.*	*Dolls.*	*No.*				
31	6	6	5	6	2	6	7	......	.....	200	1	108	L. B. G.	3	
32	26	16	6	6	0	......	......	......	.....	......	....	162	L. B. G.	2	Tu.
33	16	16	5	5	5	5	5	......	.....	0	....	2 123	G. B.	0	
34	60	0	6	6	0	......	......	......	.....	100	....	70	B.	0	
35	30	30	6	6	0	......	......	12.5	3.5	200	1	976	L. B.	0	
36	55	8	5	5	.....	......	......	12.5	3	100	....	496	L.	......	
37	......	20	5	5	0	......	......	12	3	......	....	12	L. B. G.	0	
38	15	15	5	6	0	......	......	12	3	......	1	82	L. B.	0	
39	13	....	6	6	.....	......	......	......	.....	150	1	350	L. B.	3	Tu.
....	38	29	5.6	6	.....	7.1	7.6	......	.....	282	1	471	....	16.4	

[b] There are also about 200 cows kept by private families.

TABLE V.—*State standards for milk, skimmed milk, and cream.*

States.	Milk.				Skimmed milk.				Cream.
	Total solids.	Solids not fat.	Fat.	Specific gravity.	Total solids.	Solids not fat.	Fat.	Specific gravity.	Fat.
	Per ct.	*Per ct.*	*Per ct.*		*Per ct.*	*Per ct.*	*Per ct.*		*Per ct.*
District of Columbia		9	3.5		9.3				20
Georgia		8.5	3.5			8.5	3.5		
Illinois [a]	12		3						[b]15
Indiana		9	3						
Iowa	12.5		3						15
Kentucky	12		3						15
Maine	12		3						
Maryland	12.5		3.5						
Massachusetts	13	9.3	3.7			9.3			
April-September	12	9	3						
Michigan	12.5		3	1.029-1.033				1.032-1.037	
Minnesota	13		3.5						20
Montana [c]	12		3	1.025					
Nebraska			3						15
New Hampshire	13	9.5	3.5						
April-September	12	9	3			9			
New Jersey	12								
New York [d]	12		3						
North Dakota	12		3						15
Ohio [d]	12		3						
May-June	11.5								
Oregon	12	9	3						
Pennsylvania [e]	12.5		3	1.029-1.033			[f]2.5	1.032-1.037	
Rhode Island	12		2.5						
South Carolina		8.5	3						
Utah						9			
Vermont	12.5	9.25	[g]4						
May-June	12								
Washington		8	3						18
Wisconsin			3						

[a] Condensed milk shall be made from milk containing at least the legal standard of 3 per cent butter fat and evaporated to one-third or less of its original volume.

[b] Coffee cream shall contain at least 15 per cent of fat, and whipping cream 22 per cent fat.

[c] Applies to cities with a population over 5,000.

[d] In New York and Ohio the milk solids of condensed milk shall be in quantity the equivalent of 12 per cent of milk solids in crude milk, of which solids 25 per cent shall be fat.

[e] Milk and skimmed milk standards refer to cities of second and third class.

[f] Six per cent cream by volume.

[g] As basis for payment at factories.

SHORT STATEMENTS REGARDING THE MILK SUPPLY OF CITIES AND TOWNS.

In the following pages are given briefly and in narrative form such statistical and other general information as it has been possible to collect in the course of this inquiry regarding the milk supply of every one of the 161 cities in the United States having a population of over 25,000, according to the census for 1900, and of 39 others selected from the large number of smaller cities and towns. The data thus given show, therefore, the conditions as reported by 200 representative cities and towns in the United States.

The cities and towns of each State are grouped together in the order of their size; and those in each group are preceded by a general account for the entire State whenever there are facts of interest which apply to the State as a whole. This latter includes an abstract of State laws relating to milk, and a few words to show what has been done under these laws by the State authorities.

The statement for each city and town includes the following information, or so much of it as has been obtainable: First, the name and title of the official most closely connected with the supervision of the milk supply; second, general statistics—the amount of milk used, the way it is handled, the prices for which the producers and retailers sell it, and the number and location of herds supplying it; third, an abstract of the local ordinances, regulations, etc., relating to the milk supply (care has been taken to give in considerable detail the requirements of the milk ordinances in all cities of Class I, but in others many of the ordinary requirements are omitted or barely referred to); fourth, a summary of the work done by the authorities in the supervision of the milk supply—the amount of money expended for this purpose, the number of officials employed, and numbers of inspections of dairies, and chemical and bacteriological examinations of milk; fifth, mention of a few ways in which recent improvement of the milk supply has been shown, if at all, and suggestions for further improvement; and, sixth, additional matter of interest, whenever supplied, such as the results of special investigations. With very few exceptions, every statement is based wholly upon reports received from the official named in connection with it.

ALABAMA.

This State has no milk law.

Mobile. (Population, 38,469.)

[For comparison with other cities in Class III, see p. 34.]

D. T. Rogers, clerk of the board of health.

Milk is sold from 8 stores and 35 wagons. A portion of the milk is delivered in glass bottles, which are filled at the farms. The retail price is 10 cents per quart throughout the year. There are no "model dairies" near the city. Milk is supplied from 35 dairy farms, all within a radius of 6 miles.

The city has no milk ordinance and exercises no supervision over its milk supply.

Birmingham. (Population, 38,415.)

[For comparison with other cities in Class III, see p. 34.]

W. B. Fleming, chief inspector of meat and milk.

The estimated daily consumption of milk is 2,000 gallons, or an average of 0.42 pint per capita. Milk is sold from 2 stores and 100 wagons. About 50 per cent of the milk is delivered in glass bottles, which are usually filled at the farms. The retail price of milk is 8 cents per quart in summer and 9 cents in winter. The milk from 2 "model dairies" is sold for 9 cents per quart in summer and 10 cents in winter. Within the city limits there are 20 herds, including 300 cows, and milk is sent in from 90 dairy farms. About 10 per cent is received by railway, the longest shipment being 50 miles.

An ordinance adopted in September, 1899, regulates the sale of milk in the city. License for supplying milk is as follows: For 10 or fewer cows, $5; over 10 cows, $10; but private families keeping not more than 2 cows may sell the surplus milk to their neighbors without license. Adulterated, etc., milk is prohibited. Cows producing milk for the city must be tested with tuberculin. The milk standard is 12.5 per cent solids, 3 per cent fat, and a specific gravity at 60° F. between 1.029 and 1.033. Skimmed milk must contain 9 per cent milk solids not fat.

One thousand dollars is expended annually in the supervision of the city milk supply, one milk inspector giving his entire time to this work. In the past three months 500 samples were examined by lactometer, Babcock test, and gravimetric analysis; all the city herds and 40 of the 90 dairy farms were inspected.

The inspector states that better sanitary conditions should obtain at dairies, and more care should be exercised in feeding milch cows.

Montgomery. (Population, 30,346.)

[For comparison with other cities in Class III, see p. 34.]

W. L. Stewart, milk inspector.

John L. Harley, clerk of the sanitary department.

The amount of milk sold daily is estimated as 540 gallons, or 0.14 pint per capita, besides 20 gallons of skimmed milk and 25 gallons of cream. In explanation of this low consumption of milk, it is stated that nearly half of the families in the city keep their own cows and sell milk. This milk is not included in the above estimate. Milk is sold from no stores, but from 25 wagons. Only a limited quantity of milk is delivered in glass bottles, and these are filled at the farms. None is pasteurized. The retail price of milk is 10 cents per quart throughout the year, the producers selling direct to the consumers. No dairy near the city is conducted in an entirely satisfactory manner. Milk is supplied from one herd of 14 cows within the city limits, and 19 herds (537 cows) on farms within a radius of 8 miles.

Milk ordinances adopted in September, 1896, regulate the sale of milk. All persons selling or supplying milk must take out an annual license, at the rate of $5 for 10 cows or under, and $10 for any number exceeding 10 cows, but persons who keep not more than 2 cows for family use and sell the surplus milk to neighbors are exempt from license. Adulterated, etc., milk is prohibited. Cows producing milk to be used in the city must be free from dangerous disease, and must be tested with tuberculin. The milk standard is 12.5 per cent solids, 3 per cent fat, and specific gravity at 60° F. between 1.029 and 1.033. Skimmed milk standard is 9 per cent milk solids not fat.

One thousand dollars is expended annually in the supervision of the milk supply. A milk chemist and inspector gives his entire time to this work. During the past year 864 samples of milk were examined by lactometer, Babcock test, and gravimetric analysis, besides tests for coloring matter and preservatives; several examinations were made for tubercle bacilli. The cows at 17 dairy farms were tested with tuberculin, and all dairies were examined once a month as to sanitation, food, manner of handling milk, etc.

Recently there has been an improvement in the character of the milk supply and in the sanitary condition of dairies. It is believed that more sanitary dairy buildings are needed.

ARIZONA.

This Territory has no milk law.

ARKANSAS.

This State has no milk law.

Little Rock. (Population, 38,307.)

[For comparison with other cities in Class III, see p. 34.]

R. B. Christian, secretary of the State board of health.

The amount of milk sold daily is about 1,300 gallons, or 0.26 pint per capita. In explanation of this small consumption of milk, it is stated that a large proportion of the city families keep their own milch cows, whose product is not included in the above figures. Milk is sold from a few stores and about 40 wagons. Within the city there are 25 herds, including 250 cows, and milk is sent in from 40 dairy farms, the most distant being 12 miles from the city.

The city has no milk ordinance and exercises no supervision over its milk supply.

CALIFORNIA.

J. M. Thomas, agent and secretary of the State dairy bureau, San Francisco.

Statutes of 1899—chapter 136 refers to milk. No person shall sell impure milk or cream, or milk that is from cows fifteen days before or five days after parturition, or milk from cows that are diseased or fed unwholesome food. It is the duty of the State dairy bureau to inspect any dairy complained of as having diseased cows or being in an insanitary condition, and the bureau may require changes at places inspected. The State veterinarian may order the slaughter of diseased animals at the expense of owners. County district attorneys shall prosecute offenders.

Statutes and amendments to the Codes, extra session, 1900–1901, page 324: The use of incorrect glassware, Babcock testers, etc., in determining the richness of milk or cream as a basis for payment therefor is prohibited.

The State exercises no supervision over the milk supply of cities.

San Francisco. (Population, 342, 782.)

[For comparison with other cities in Class I, see p. 26.]

Adolph Sutro, president of the board of health.

The daily consumption of milk is estimated as 25,000 gallons, or 0.58 pint per capita. It is estimated, also, that the city consumes daily 500 gallons of skimmed milk and 1,500 gallons of cream. Milk is sold from 173 stores and 350 wagons. Glass bottles are used by large dealers in the delivery of about one-fourth of the total milk supply; they are filled in the city. Practically no pasteurized milk is used. The retail price of milk is 5 to 7 cents per quart throughout the year, the producers receiving 2 to 3 cents. There are no dairies near the city which could be classed as "model dairies." Within the city there are 196 herds, including 5,880 cows, and milk is sent into the city from 300 dairy farms, the longest shipment being 60 miles.

The milk ordinance of January, 1896, gives authority to the board of health to regulate the milk supply. Some of the principal requirements of the ordinance and regulations are as follows: Each person selling milk in the city must have a permit. This is issued without cost by the board of health only after certain detailed information regarding the source of the milk and the conduct of the proposed business has been filed; it is revocable for cause. A permit is required for every place where milk is sold. Each person holding a permit must file at least once a year a detailed statement containing data similar to that in the application. Permit number shall be prominently displayed wherever milk is sold. The ordinance forbids the sale of impure, etc., milk, including milk from cows fifteen days before or five days after calving; milk from cows given unwholesome food or water, or kept in insanitary condition, or affected with disease; milk to which any water or other substance has been added, or from which any cream has been removed; milk that is drawn from cows or by milkers that are unclean; and milk containing less than 12 per cent solids, or 3.2 per cent fat. Swill, garbage, or milk diluent must not be carried in delivery wagons. The board of health must occasionally have inspected all dairies from which milk is brought into the city. Owners of dairies must report conditions which might render milk impure. The sale of condensed milk, buttermilk, or sour milk is permitted if from pure milk; the proportion of solids in condensed milk must be equivalent to 12 per cent solids in crude milk and 26.5 per cent of them must be fat. Market inspectors are required to visit, twice a month, all dairies in the city and county and they are requested to visit milk ranches at least once a month. In certain parts of the city no person may keep more than 2 cows.

The ordinance section concerning carrying swill on milk-delivery vehicles is given in Appendix I (p. 180).

The city makes no special appropriation for the supervision of its milk supply, nor is any officer designated to give his entire time to this work. During the past year 464 samples of milk were examined for specific gravity and fat by lactometer and Babcock test, checks being occasionally made by the Westphal balance, butyro-refractometer, and gravimetric analysis; 3 samples were examined bacteriologically—2 for tubercle and 1 for typhoid bacilli; none of the city dairies or dairy farms sending milk to the city have been inspected.

It is not stated that the milk supply has recently shown any marked improvement. Liberality in providing funds for the health department to carry on a thorough inspection of dairies is recommended. It is also urged that milk users be more particular as to the character of the milk delivered to them.

Los Angeles. (Population, 102,479.)

[For comparison with other cities in Class I, see p. 26.]

George W. Hood, milk inspector.

The amount of milk sold daily is estimated as 4,500 gallons, or 0.35 pint per capita, besides 150 gallons of cream and a very small amount of skimmed milk. These figures do not include the milk produced by town cows and not sold, hence the average daily consumption is greater than 0.35 pint per capita. Milk is sold in nearly all grocery stores and in many of the fruit stores, and is served from 112 wagons. Glass bottles are used largely in the delivery of milk, being filled only at the dairies. It is estimated that about 1,000 gallons of milk is pasteurized daily, the practice having increased since the use of formalin was stopped. The retail price of milk is 5 cents per quart, both summer and winter, and the price paid the producer is just half that amount. There is only one "model dairy," which receives 7½ cents per quart throughout the year for its product. Within the city limits there are 25 dairy herds, including about 500 head. Milk is sent into the city from 2,000 cows, on about 75 dairy farms. About 5 per cent of the milk supply is received by rail, the longest shipment being 20 miles.

City milk ordinance (No. 6492), adopted in March, 1901, requires all milk or cream dealers to have an annual permit, granted by the board of health free of charge. Dairies, cows, cow stables, milk houses, milk vessels, and vehicles, whether within the city limits or not, must be subject to inspection by a board of health officer. Milk must be reduced to 60° F. before it is put into closed cans or marketed, and delivery wagons must be covered during the months of May to September. Bottling must be done at the milk houses and not upon the delivery wagons. The delivery of bottled milk to any dwelling where there is a contagious disease is prohibited. The milk standard is as follows: Specific gravity, 1.03; butter fat, 3.4 per cent; total solids, 12 per cent; cream by volume, 9 per cent. Cream standard, butter fat 20 per cent. Skimmed milk may be sold if plainly labeled. Milk is prohibited from cows fed on any garbage or other improper food, or kept in an unsanitary condition.

In 1899 a resolution was adopted by the board of health prohibiting the delivery of milk in bottles. This resolution was passed because of the practice of refilling the glass jars in delivery wagons or elsewhere, without having the jars properly cleansed, thereby making it possible for contagious diseases to be conveyed and milk to be otherwise contaminated. The length of time this rule was in effect is not given.

The annual expenditure for the supervision of the city milk supply is about $1,100, one inspector giving his entire time to this work. During the year 419 samples of milk were examined by lactometer and the Babcock test; a part of them also for formalin. All dairy farms and all cows from which milk is used have been inspected. A detailed statement of the work performed by the milk inspector in the year ending November 30, 1899, is as follows:

Inspections of dairies, ranches, and milk depots	1,782
Samples of milk tested	765
Cows condemned (tuberculosis)	6
Cows tested (tuberculosis)	6
Complaints sworn to	10
Arrests	10
Convictions	8
Acquittals	1
Cases pending	1

The general average percentage of butter fat in samples tested this year was 3.6. Samples from hotels and restaurants averaged only 2.8, while those from dairy wagons averaged 3.7.

The form for dairyman's permit to sell milk, and stub for same, is shown in Appendix IV (p. 201).

Recent improvements in the quality of milk are due to the decreased use of preservatives and a better sanitary condition of the dairy premises. A more thorough inspection of the cattle, dairies, and milk, and a more rigid enforcement of the ordinances, would bring about further improvement.

Oakland. (Population, 66,960.)

[For comparison with other cities in Class II, see p. 30.]

Fred E. Pierce, D. V. S., market, meat, and milk inspector.

The daily consumption of milk is estimated as 4,500 gallons, or 0.54 pint per capita, besides about 100 gallons of skimmed milk and 75 gallons of cream. Milk is sold from 45 stores and 80 wagons. Glass bottles, filled in the city depots, are used in the delivery of only a very small portion of the milk supply. The practice of pasteurizing milk has been discontinued. The retail price of milk varies during the year from 5 cents to 10 cents per quart, producers receiving 3 to 3½ cents throughout the year. About 3,500 cows, in 45 city herds and 35 country herds, furnish the city with milk. A very small portion of the milk supply is received by railway, the longest shipment being 40 miles.

Ordinance No. 1618, July, 1894, refers to milk. Persons selling milk must be registered. Impure, adulterated, etc., milk is prohibited. The milk standard is 3 per cent fat. Skimmed milk must be labeled.

About $1,200 is expended annually in the supervision of the milk supply, one inspector giving the greater part of his time to this work. During the past year 250 samples of milk were examined by the Babcock test, 10 samples were examined bacteriologically, and all the city herds and all the dairy farms were inspected.

Recent improvement has been made in the sanitary condition of the dairies. The enactment and enforcement of measures to require cleanliness in the production of milk is given as an important need.

Sacramento. (Population, 29,282.)

[For comparison with other cities in Class III, see p. 34.]

H. L. Nichols, M. D., health officer.

The daily consumption of milk is estimated as 3,000 gallons, or 0.82 pint per capita, besides 50 gallons of cream. Milk is sold from 15 stores and 55 wagons. Glass bottles are used to a small extent (mostly for cream), and they are filled both in the city and at the farms. Very little milk is pasteurized, and the practice is not increasing. The retail price of milk is 7 cents per quart throughout the year. There are no dairy herds within the city limits, but about 100 cows are kept by private families. Milk is brought to the city in wagons from 36 dairy farms, the longest haul being 7 miles.

City ordinance No. 428 and board of health ordinances Nos. 48 and 49 refer to milk. Permits for the sale of milk are issued free of charge. The sale of impure, adulterated, etc., milk is prohibited. The milk standard is 12 per cent solids, 3 per cent fat. Dairies supplying milk to the city must be kept clean, and all utensils used in handling milk must be sterilized with boiling water once a day. Garbage, etc., must not be carried in milk wagons. Condensed milk and buttermilk must be from pure milk. Condensed milk must have milk solids equivalent to 12 per cent milk solids in crude milk; 26.5 per cent of the milk solids must be fat.

About $1,300 is expended annually in the supervision of the city milk supply, one inspector giving his entire time to this work. During the past year 1,200 samples of milk were examined by the Babcock test, and all the dairy farms were inspected.

San José. (Population, 21,500.)

[For comparison with other cities in Class IV, see p. 40.]

Robert Caldwell, M. D., secretary and health officer.

The daily consumption of milk is estimated as 2,512 gallons, or 0.93 pint per capita, besides small amounts of skimmed milk and cream. Milk is sold from 40 stores and 100 wagons. Glass bottles, filled at the farms, are in general use in the delivery of milk. The retail price is 5 cents per quart throughout the year, producers receiving 3 cents in the summer and 3½ cents in the winter season. There are a few dairies near the city conducted on a more modern plan than others, but they receive no advance in price for their product. Within the city limits there are 3 herds, including 40 cows, and milk is brought in wagons from 127 dairy farms, all within 7 miles of the city.

Ordinances Nos. 1650 and 1654 refer to milk. License for the sale of milk is free. Adulterated, impure, etc., milk is prohibited. The milk standard is 13 per cent solids, one-fourth of which shall be butter fat. Skimmed milk must be labeled. Wagons must bear license number. The board of health has passed a regulation requiring that all cows furnishing milk for the city be tested with tuberculin.

Six hundred dollars is expended annually in the supervision of the milk supply, the milk and market inspector giving a part of his time to this work. During the past year milk samples were examined by the Babcock test. No bacteriological examinations were made. All the city herds and all the dairy farms were inspected.

Recent improvement in the milk supply is due to greater cleanliness at the dairies and a veterinary inspection of cows. It is stated that there would be further improvement if a State board of veterinary inspectors should examine all cows and kill those found to be affected with tuberculosis.

Alameda. (Population, 16,464.)

[For comparison with other cities in Class IV, see p. 40.]

T. Carpenter, V. S., veterinary and food inspector.

The daily consumption of milk is estimated as 1,760 gallons, or 0.86 pint per capita, besides 50 gallons of skimmed milk and 100 gallons of cream. Milk is sold from 21 stores and 38 wagons, and about 30 per cent of it is delivered in glass bottles, which are filled in the city. Several consumers pasteurize their own supply. The retail price of milk is 6¼ cents per quart throughout the year, producers receiving 3 cents in summer and 3¼ cents in winter. The milk from 5 "model dairies" near the city is sold for 7½ cents per quart in summer and 8⅓ cents in winter. There are 11 herds, including 62 cows, within the city limits, and milk is sent in from 23 dairy farms. About 9 per cent is received by railway, the longest shipment being 45 miles.

Ordinances No. 318, June, 1896, and No. 368, October, 1898, and board of health regulations govern the milk supply. Permit is required for the sale of milk or cream. Impure or adulterated milk, or milk from cows within fifteen days before or ten days after calving, is prohibited. The milk standard is 12.5 per cent solids. Skimmed milk must contain 7.5 per cent milk solids and be plainly labeled. Cows must be free from dangerous disease and must not be fed upon wet brewers' grains, swill, etc., nor kept in an insanitary condition. Contagious disease among employees must be reported. Wagons must bear owner's name, etc.

Board of health rules and regulations for the handling of milk include a number of those published in the Seventeenth Annual Report of the Bureau of Animal Industry, pages 165–171. They are published on large cloth-backed cards, suitable for posting in stables, etc.

Twelve hundred dollars is expended annually in the supervision of the milk supply, one official giving his entire time to this work. During the past year 925 samples of milk were examined by lactometer, Babcock test, and gravimetric analysis; 20 bacteriological examinations were made "for milk ferments, blood corpuscles, etc.;" all the city herds and all the dairy farms were inspected.

Recently there has been an improvement in the health of the cows and in the sanitary method of handling milk. Needed improvements, as given, include the stamping out of tuberculosis and regulations to control dairy herds and the transportation of milk.

COLORADO.

This State has no milk law.

Denver. (Population, 133,859.[1])

[For comparison with other cities in Class I, see p. 26.]

Charles K. Cook, milk inspector.

S. B. Newland, deputy State dairy commissioner.

The daily consumption of milk is estimated as 12,110 gallons, or 0.65 pint per capita. It is also estimated that the city consumes daily about 1,000 gallons of skimmed milk and 2,000 gallons of cream. Milk is sold from only 200 stores, the greater part of it being distributed from 300 wagons, many delivering twice a day. About 25 per cent is delivered in glass jars, which are filled in the city or on the dairy farms. The entire product of one establishment, amounting to 4 per cent of the total milk supply, is pasteurized. The retail price of milk is 5 to 6¼ cents per quart in summer and 6¼ to 8⅓ cents in winter, the producers receiving 2½ to 3 cents per quart throughout the year. Within the city limits there are 80 herds of 3 or more cows each, including 900 head, and about 1,500 separate or private cows. About 300 dairy farms send milk into the city. Of the total supply, about 10 per cent is received by rail, the longest shipment being 150 miles.

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[1] Including average transient population, 150,000.

Numerous milk regulations were published in the manual of the bureau of health in 1899. They are generally drawn up in considerable detail for the protection of milk consumers against the use of impure or adulterated milk, or milk produced in insanitary places or from cows suffering from tuberculosis or other disease. The sale of milk from cows two weeks before or two weeks after calving is prohibited. The milk standard is 12 per cent total solids, 3 per cent fat; the cream standard, 25 per cent total solids, two-thirds of which shall be butter fat. Skimmed or watered milk may be sold to any person for his own individual consumption, if he is informed of the character of the article. When milk below the legal standard is used in hotels, restaurants, etc., a sign must be displayed bearing the words "watered milk." License (fee $1 for one year) is required for each store or vehicle selling milk. A set of 10 rules relating to the production of milk—cleanliness and ventilation of stables, cleanliness of employees, straining of milk twice, cooling of milk and use of ice during its delivery in warm weather, use of screens to exclude flies from milk rooms, prohibition of preservatives—are printed on cloth by the health commissioner to be posted in dairy stables.

Ordinance section regarding notice of use of watered milk is given in Appendix I (p. 180).

The city expends annually $1,200 for the supervision of the milk supply. One milk and dairy inspector devotes his entire time to this work, and he is occasionally assisted by the city chemist. During May, June, July, and August 1,200 samples of milk and 1,000 samples of cream were examined by the Babcock test, 600 samples were analyzed gravimetrically, and a few samples of milk were examined bacteriologically. All of the milch cows within the city limits and all the dairy herds outside which send milk to the city have been inspected.

Pueblo. (Population, 28,157.)

[For comparison with other cities in Class III, see p. 34.]

H. R. Thompson, milk and dairy inspector.

The daily consumption of milk is estimated as 5,000 gallons, or 1.42 pints per capita; also 350 gallons of skimmed milk and 200 gallons of cream. Milk is sold from 10 stores and 40 wagons. Thirty-three per cent of the milk is delivered in glass bottles, which are filled at the farms; none is pasteurized. The retail price of milk is 6 cents per quart in summer and 7 cents in winter. Within the city limits there are 20 herds, including 650 cows, and milk is sent in from 17 (?) dairy farms. Ten per cent of the cream is received by railway, the longest shipment being 20 miles.

The city expends annually about $1,000 in the supervision of its milk supply, one dairy and milk inspector giving his entire time to this work. In the past nine months 344 samples of milk were examined by the lactometer, Babcock test, and by chemical tests for preservatives; no bacteriological examinations were made; all the city herds and all the country farms were inspected, 15 of the city herds being tested with tuberculin.

Recently there have been a higher fat content and a marked decrease in the use of preservatives. Needed improvements, as given, include better methods for cooling and aerating milk, sterilizing cans, and better sanitary conditions at the dairies.

Colorado Springs. (Population, 21,085.)

[For comparison with other cities in Class IV, see p. 40.]

R. H. Custer, food inspector.

The daily consumption of milk is estimated as 1,800 gallons, or 0.68 pint per capita, besides 300 gallons of skimmed milk and 80 gallons of cream. This does not include the milk from about 200 cows kept by private families. Milk is sold from 19 stores and 28 wagons. None of the milk is shipped in glass bottles, but nearly all dairies use them and charge a higher price for the bottled product. Pasteurized milk is used by invalids, and at present many private families do their own pasteurizing. The retail price of milk is 5 cents per quart throughout the year, bottled milk 6¼ cents, and pasteurized milk 8⅓ cents, producers receiving 3 cents to 3½ cents per quart. The milk from 3 "model dairies" is sold for 6¼ cents. Within the city there is 1 herd (60 cows), and milk is sent in from 17 dairy farms. The longest shipment of milk to the city is 14 miles.

An ordinance adopted in December, 1897, refers to milk. License fees for the sale of milk or cream are $5 for each wagon and store; $5 for each shipper who does not send to a licensed dealer; but persons who keep not more than 2 cows, and stores which sell milk or cream from a regular registered dairyman, pay only $1. Impure, adulterated, etc., milk is prohibited, except that skimmed or watered milk may be sold if the buyer is informed of its character. "Watered milk" sign must be displayed in restaurants, etc., where milk is served that contains less than 3 per cent fat. The milk standard is 12 per cent solids, 3 per cent fat. Cream standard is 25 per cent solids, 16 per cent fat. Those handling milk must not be suffering from or exposed to contagious disease.

The food inspector (salary $1,020) gives a part of his time to the supervision of the milk supply. During the past year 175 samples of cream were analyzed gravimetrically; 3 samples were examined bacteriologically for typhus and tubercle bacilli; and 8 (of the 18) dairy herds were inspected.

Trinidad. (Population, 5,345.)

[For comparison with other cities in Class IV, see p. 40.]

D. F. Dayton, health officer.

The daily consumption of milk is estimated as 500 gallons, or 0.75 pint per capita. Milk is sold from 10 wagons, but no stores, and about two-thirds of it is delivered in glass bottles, which are filled at the farms. Dairies do not supply pasteurized milk. The retail price of milk is 6⅔ cents per quart throughout the year. There are no "model dairies" near the city, and no herds within the city limits. Milk is supplied from dairy farms within a radius of 3 miles.

The milk standard, as given by the health officer, is 12 per cent solids, one-fourth of which shall be butter fat. The cream standard is 25 per cent solids, two-thirds of which shall be butter fat.

No specific amount is appropriated for the supervision of the milk supply. During the past year 8 samples of milk were examined by lactometer, Babcock test, and gravimetric analysis; no bacteriological examinations were made; all the dairy farms were inspected. The inspector states that the milk supply would be improved if dairymen were more particular about keeping the cows' udders clean, and cooling the milk immediately after milking.

CONNECTICUT.

J. B. Noble, dairy commissioner, Hartford.

General Statutes, revision of 1887, sections 2660–2664, and Public Acts of 1899, chapter 209 refer to milk, etc. The warden and burgesses of any borough, or the mayor and common council of any city, may appoint a milk inspector, who supervise the milk supply, and is authorized to take samples (but in duplicate when requested); persons selling milk may be required to register with the city or borough clerk, the latter receiving 15 cents from the public treasury for each name registered. It is unlawful to sell impure or adulterated milk, or knowingly to sell milk from a cow that has been "adjudged, by the commissioners upon diseases of domestic animals, affected with tuberculosis or other blood disease." Skimmed milk shall be labeled as such when sold.

Public Acts of 1895, chapter 235, sections 4 and 5, refer to food products, and forbid the sale of articles that are adulterated or misbranded, these terms being defined at length. The State agricultural experiment station may fix standards of purity. The State dairy commissioner conducts prosecutions.

The State exercises very little supervision over market milk. The commissioner has examined numerous samples in connection with the experiment station.

New Haven. (Population, 108,027.)

[For comparison with other cities in Class I, see p. 26.]

Ward Bailey, clerk of the city board of health.

The average amount of milk consumed daily is 8,750 gallons, or 0.65 pint per capita. The amounts of skimmed milk and cream are not recorded. Milk is distributed from about 400 stores and 200 wagons. Glass bottles are used in the delivery of a large part of the milk supply, most of them being filled in the country. A little of the milk is pasteurized, and the quantity so treated does not seem to be increasing. The retail price of milk is 6 cents per quart in summer and 7 cents in winter, producers realizing 3½ cents and 4 cents in the two seasons. About half a dozen dairies near the city are conducted considerably better than others, but do not receive an extra price for their milk. There are no herds and only a few milch cows within the city limits. The average distance from which the milk supply is received is 10 miles.

The milk ordinance requires that venders of milk shall be licensed by the board of health. License fee is 50 cents, and licenses expire the 1st of each May. They are revocable for cause. The license number must be shown on wagons. The sale of adulterated, etc., milk, which is defined at length, is prohibited. The milk standard is 11.5 per cent total solids, 3.5 per cent fat, and specific gravity between 1.029 and 1.033. Skimmed milk may be sold if in vessels plainly labeled.

No special appropriation is provided for the supervision of the milk supply, and the entire time of no officer is given to this work. During the past year 74 samples of milk were examined with the lactometer and the Babcock test, 25 being found below the standard for butter fat, and 12 dairy farms were inspected.

There is less adulteration of milk now than formerly. There is need of a milk inspector, frequent inspection of dairy farms, and more cleanly methods where milk is produced and handled.

Hartford. (Population, 79,850.)

[For comparison with other cities in Class II, see p. 30.]

Edmund D. Roberts, milk inspector.

The daily consumption of milk is estimated as 9,000 gallons, or an average of 0.90 pint per capita, besides 600 gallons of skimmed milk, and 115 gallons of cream. It is explained that many nonresidents take their meals in the city, thus partly accounting for the apparently large average consumption. Milk is sold from 53 stores and 195 wagons. Glass bottles are used in the delivery of about one-fourth of the total milk supply, the greater part of them being filled at the farms. The experience of three dairymen who have abandoned the practice of pasteurizing is proof that there is little or no demand for pasteurized milk in the city. The retail price of milk is 6 to 7 cents per quart in summer and 7 to 8 cents in winter, the producers receiving 2½ to 3 cents per quart in summer and 3½ to 4 cents in winter. There are numerous well-conducted daries in this locality, some of which receive as high as 10 cents per quart throughout the year. Within the city limits there are 20 herds of milch cows, including 300 head, and milk is sent into the city from 171 dairy farms averaging about 22 cows each. About 3 per cent of the supply is shipped in by railway, the longest shipment being 20 miles.

Ordinance of Hartford, 1897, chapter 11, sections 15 to 23, refers to milk. Persons selling milk must be licensed; fee, 25 cents. The sale of adulterated or impure milk is prohibited. The milk inspector has made a standard for milk of 12.3 per cent solids, 3.5 per cent fat.

About $500 is expended annually in the supervision of the city milk supply, one officer giving the greater part of his time to this work. During the past year 651 samples of milk were examined by lactometer and the Babcock test; all of the city herds and 35 of the 171 dairy farms were inspected; inspections of places in private residences where milk is kept were made during the spring, summer, and fall months.

Recent improvements are shown in the care of cows and cleanliness in handling the milk. The inspector believes that stringent milk laws may do more harm than good.

Bridgeport. (Population, 70,996.)

[For comparison with other cities in Class II, see p. 30.]

E. A. McLellan, M. D., health officer.

The daily consumption of milk is estimated as 6,250 gallons, or 0.70 pint per capita, besides 250 gallons of cream. No skimmed milk is sold. Milk is sold from 200 stores and 250 wagons. In the delivery of milk, 7 establishments use glass bottles, these being filled in the city. No milk is pasteurized. The retail price of milk is 7 cents per quart in the summer and 8 cents in the winter season, producers receiving 3 cents per quart in summer and 4 cents in winter. There are no "model dairies" near the city. There are 8 herds of milch cows in the city. About one-twelfth of the total milk supply is received by railway, the longest shipment being 75 miles.

The city expends nothing in the supervision of its milk supply. Samples of milk are occasionally sent to the State experiment station for analysis. No dairy cattle have been inspected.

Needed improvements, as given, include the inspection of dairy herds, greater cleanliness in handling milk, and proper cooling facilities during the hot season.

Waterbury. (Population, 45,859.)

[For comparison with other cities in Class III, see p. 34.]

P. T. Keeley, M. D., milk inspector.

The average daily consumption of milk is estimated as 5,000 gallons, or 0.87 pint per capita; also 250 gallons of skimmed milk and 250 gallons of cream. Milk is sold from 130 stores and 125 wagons. Glass bottles, filled in the city, are used in the delivery of 25 per cent of the milk supply. Very little milk is pasteurized, and the practice is not increasing. The retail price of milk is 5 cents per quart in summer and 7 cents in winter, the producers receiving 3 cents in summer and 4½ cents in winter. No dairies are conspicuous for being conducted in a better manner than others. Within the "town" there are 200 herds, including 3,000 milch cows. Two hundred and fifty dairy farms send milk into the city. About 5 per cent is received by railway, the longest shipment being 20 miles.

The city expends annually about $1,000 in the supervision of its milk supply, one official giving his entire time to this work. During the past year 1,000 samples were examined by Babcock test, lactometer, and gravimetric analysis; two bacteriological examinations were made for typhus bacilli; all herds supplying the city with milk were inspected four times.

Improvement has recently been shown in the sanitary condition of dairies. Further improvement would result if milk samples and sanitary conditions of dairies were studied by a trained bacteriologist.

New Britain. (Population, 25,998.)

[For comparison with other cities in Class III, see p. 34.]

A. L. Thompson, city clerk.

The daily consumption of milk is estimated as 1,500 gallons, or 0.46 pint per capita, besides 50 gallons of skimmed milk and 10 gallons of cream. Milk is sold from about 30 wagons and no stores. Nearly all the dealers deliver milk in glass bottles, which are filled at the farms. Considerable milk is pasteurized, and this practice is increasing. The retail price of milk is 6 to 7 cents in summer and 7 to 8 cents in winter, producers receiving 5 and 6 cents per quart in the two seasons. There are no dairies near the city which are conducted in an entirely satisfactory manner. One herd of 40 cows within the city limits and 28 herds outside produce the milk supply.

Nothing is done to supervise the milk supply.

DELAWARE.

This State has no milk law.

Wilmington. (Population, 76,508.)

[For comparison with other cities in Class II, see p. 30.]

Walter A. McEvilly, inspector of milk.

The daily consumption of milk is estimated as 3,756 gallons, or 0.39 pint per capita, besides 250 gallons of skimmed milk and 25 gallons of cream. Milk is sold from 55 stores and 341 wagons. About one-half of the milk supply is delivered in glass bottles, some of these being filled in the city and some at the producing farms. No milk is pasteurized. The retail price of milk is 6 cents per quart in summer and 8 cents in winter, producers receiving 3 and 4 cents in the two seasons. There are no so-called model dairies in the vicinity. Within the city limits there are 9 herds, including 85 cows. Two hundred dairy farms send milk into the city. About one-half of the total supply is received by railway, the longest shipment being 40 miles.

An ordinance adopted in December, 1901, amending a previous ordinance, refers to milk. Adulterated, etc., milk is prohibited. Skimmed milk must be labeled. The milk standard is 12 per cent total solids, 3 per cent fat.

The city expends annually $1,500 in the supervision of its milk supply. Two officials—a chemist and an inspector—give their time to this work. The milk inspector receives $1,000 salary and finds his own implements. During the past year 125 samples of milk were examined by lactometer; all samples not up to standard were analyzed gravimetrically; 125 samples were examined bacteriologically; all the dairy farms sending milk into the city were inspected, but none of the dairy herds within the city were inspected.

Suggested improvements include the rigid enforcement of milk laws and the maintenance of prices which will enable dealers to sell the pure article.

DISTRICT OF COLUMBIA.

The District laws are the same as those referred to under Washington City.

Washington. (Population, 278,718.)

[For comparison with other cities in Class I, see p. 26.]

William C. Woodward, M. D., health officer.

The daily consumption of milk is estimated as 12,500 gallons, or an average per capita of 0.36 pint. The amounts of skimmed milk and cream are not known. Milk is sold from 114 licensed dairies and about 150 wagons. Glass jars are in general use in the delivery of milk. They are not used for shipping, but are filled in the city. Perhaps 100 gallons of pasteurized milk is sold daily; this treatment does not seem to be gaining in favor. The retail price is 6 to 8 cents per quart throughout the year, the producers on the farms receiving 2 to 3 cents in summer and 3½ to 4½ cents in winter. One or two dairies near the city are conducted in an entirely satisfactory manner, and their milk is retailed at 10 to 12 cents per quart. One hundred and thirty-six dairy herds, including 1,127 cows, are within the limits of the District of Columbia, and milk is sent into the District from 630 dairy farms, the longest shipment being 92 miles.

Chapter 164, Session III, Fifty-third Congress, March, 1895, refers to the milk supply of the District of Columbia. A permit from the health officer is required for maintaining a dairy within the District. This is issued after the dairy premises have been inspected and approved. Permit is also required for sending milk into the District, this to be issued if the health officer is satisfied with the detailed description of the dairy farm, and the sworn statement as to the physical condition of the cattle, which must accompany the application. Every person receiving this permit must agree to allow his premises to be inspected at any time, and to conform to the health officer's regulations. Permits are issued without charge and are revocable for cause. No person is debarred from selling milk during the time his application for permit is being considered. Persons recently exposed to contagious disease shall not work in a dairy. Milk wagons must show permit number, location of dairy, etc. Names of dairymen furnishing milk must be displayed in stores, etc., where milk is sold. The sale of unwholesome or adulterated milk, or milk from cows fed on swill, etc., or milk from diseased cows, or milk taken from cows less than 15 days before or 10 days after parturition is prohibited. Skimmed milk may be sold if plainly labeled; its standard is 9.3 per cent solids.

Chapter 25, Session II, Fifty-fifth Congress, refers to foods. It prohibits adulterated food, the same being defined at length and including milk altered in any way, and it makes the milk standard 9 per cent solids not fat, 3.5 per cent fat, and the cream standard 20 per cent fat.

Under authority of the first law above mentioned, regulations governing the milk supply are made by the health officer. They specify, in considerable detail, conditions which shall be found where milk is produced and handled, requiring sanitary buildings, pure water for cleaning purposes, cleanly methods, etc.

A copy of the health officer's regulations for the government of dairies and dairy farms is shown in Appendix I (p. 167).

Two veterinary surgeons give their entire time, and a chemist part of his time, to the supervision of the milk supply. During the year 413 samples of milk were examined with the Babcock test and lactometer, some of them being analyzed gravimetrically; no bacteriological examinations were made; all the dairy herds in the District were repeatedly inspected, and 205 of the 704 dairy farms were inspected.

The form for application to bring milk into the District is shown in Appendix IV (p. 193). The form for notification of violation of the law is shown in Appendix IV (p. 209).

Recent improvements are shown in the sanitary conditions of dairy farms and the health of the herds. Recommendations for further improvement include: An official indorsement of properly conducted dairies; the eradication of tuberculosis from dairy herds; better lighting, ventilation, and drainage, and greater cleanliness of barns and dairies; the branding of condemned cows; the immediate cooling of milk and its maintenance at a low temperature till final delivery.

In a special report, dated May 3, 1900, by Dr. J. P. Turner, inspector of live stock and dairy farms, prepared, under the direction of the health officer, in compliance with a resolution of the Senate, much interesting information is given regarding the conditions existing on dairy farms supplying milk and cream to the District and the amount of work performed in the interest of their improvement. It states that there were in the District 135 farms producing daily 2,000 gallons of milk, some of these farms being inspected as often as once a month. Only about one-third of the 600 dairy farms in Virginia and Maryland sending milk into the District had been inspected. Wherever inspections are made, the following points are included: The physical examination of cows, the sanitary condition of the barn, methods of cleaning and milking the cows, facilities in the dairy room for cooling and handling milk, and the character of the food and water supply. About 3,500 gallons of milk from uninspected dairy farms were received daily over the Baltimore and Ohio Railroad, and the same amount over the Southern Railroad. Permits are held by all the shippers of this milk, having been given on a basis of their own statements of conditions in their dairies. It is well known that the sanitary conditions on many farms are not such as the health department regulations require, as, whenever the area in which inspections are made is extended, many diseased cows are found and many buildings have to be abandoned or altered. In the inspected area, which supplies about one-third of the milk used in the city, 140 diseased cows were condemned in 1897 and 120 in 1899. It is shown that not a few of the veterinarian's reports upon herds beyond the inspected districts are unreliable. Tuberculosis is the disease most commonly found, over 50 per cent of the cows condemned being affected with it. The tuberculin test has been the means of finding many badly diseased animals which could not be detected by a thorough physical examination. The importance of requiring the removal of diseased cows from dairy farms, after their condemnation, is emphasized. It is recommended also that farmers be reimbursed for at least a part of their loss when their cows are condemned. Many dairy barns have been greatly improved by the construction of good floors and gutters, windows, and ventilators, and the use of whitewash has done much to improve their sanitary condition. The old dark basement barn is gradually disappearing. In some respects, methods of milking are more cleanly than in the past, though there is yet much room for improvement. Cows are kept fairly clean, but the filthy habit of "wet" milking and the neglect of personal cleanliness prevails in too many dairies. The use of separate milk rooms and the cooling of milk to below 50° F. is strongly recommended. The feeds given milch cows are generally satisfactory. Some farmers are using ensilage and no unfavorable results have been noted when the silo was properly built and filled. In making inspections, special attention is given to the water supply.

The report above abstracted was accompanied by one from the chemist and inspector of dairy products. The only forms of intentional adulteration of milk are the addition of water, coloring matter, and preservatives, and the removal of cream. A few years ago these were very common, but to-day they exist only to a small extent. Unintentional forms of adulteration, through which different forms of bacteria, including the germs of disease that are most likely to enter the milk, are discussed at length. The amount of acidity found in 146 samples of milk, collected in one year, varied between wide limits; 5 samples contained from 1.08 to 3.25, the remaining 141 varied from 0.27 to 0.96 per cent acidity, their average being 0.52 per cent.

During a recent winter a bacteriological study of the milk sold in the District was made by the veterinary inspector, the bacterial content per cubic centimeter was found to vary from 2,500 to 100,000,000. Of 117 samples examined, 9 contained more than 1,000,000 bacteria per cubic centimeter, 36 contained from 100,000 to 1,000,000, and 20 contained less than 10,000 per cubic centimeter.

FLORIDA.

Revised Statutes, sections 2659 and 2660, refer to foods. It is unlawful to sell diseased or unwholesome food except when the buyer is fully informed, and the sale of food adulterated with any substance injurious to health is forbidden.

Jacksonville. (Population, 28,429.)

[For comparison with other cities in Class III, see p. 34.]

Claude Joyner, health officer.

The daily consumption of milk is estimated at 1,200 gallons, or 0.34 pint per capita. Milk is sold from 75 stores and 35 wagons. About one-half of the milk is supplied in glass bottles, and these are filled at the farms. A large amount of milk is pasteurized, but the practice is not increasing. Milk is retailed at 10 cents per quart throughout the year, the producers receiving 7 cents per quart. There are no "model dairies" near the city. There are no dairy herds within the city limits. The milk supply is produced by 560 cows on 35 dairy farms, within 4 miles of the city.

An ordinance adopted in April, 1888, and amended in October, 1899, refers to milk. The health officer must examine the city milk supply. License is required for the sale of milk. Adulterated, etc., milk is prohibited. The water at dairies must be pure. The milk standard is 12 per cent solids, 3 per cent fat, board of health lactometer reading of 100° at 60° F., and show "6 per cent of cream by the lactometer."

During the past year 185 samples of milk were examined by lactometer and Babcock test, and all the dairy farms were inspected.

GEORGIA.

Acts of 1895, part 1, title 7, No. 207, sections 1 and 2, refer to milk. The sale of unclean, unwholesome, or adulterated milk, or milk from an animal less than 15 days before or 5 days after parturition is prohibited. The milk standard is 3.5 per cent fat, 8.5 per cent other solids. Skimmed milk and buttermilk may be sold as such.

Atlanta. (Population, 89,872.)

[For comparison with other cities in Class II, see p. 30.]

George M. Hope, chief of the sanitary department.

Estimated amount of milk used daily is 1,500 gallons, or 0.13 pint per capita; also 300 gallons of skimmed milk, 101 gallons of cream, and 2,500 gallons of buttermilk. Milk is distributed from 10 stores and 350 wagons. Glass jars are used to a certain extent, being filled in the country or in the delivery wagons in the city. None of the milk is pasteurized. The retail price per quart for milk is 5 cents in summer and 6 cents in winter, producers receiving 3 cents in summer and 4 cents in winter. The few "model dairies" sell their product at 7 cents per quart in summer and 9 cents in winter. About 2,129 milch cows in 3 city herds and 350 country herds furnish the city with milk. Only about 300 gallons of milk are received by railway, the longest shipment being 20 miles.

Two inspectors devote a large part of their time to the supervision of the city milk supply, having examined during the past year 1,250 samples chemically, but none bacteriologically; and inspected all of the city dairies and nearly all of the farms sending milk into the city. A report issued by the city board of health in 1899 shows that about 8 per cent of the samples analyzed failed to come up to the requirements of the law, while 62 per cent showed more than 13 per cent total solids.

It is claimed that the milk standard should be raised.

Savannah. (Population, 54,244.)

[For comparison with other cities in Class II, see p. 30.]

W. F. Bunner, health officer.

The daily consumption of milk is estimated as 3,000 gallons, or 0.44 pint per capita, besides an unknown quantity of skimmed milk and cream. Milk is sold from 10 stores and numerous wagons. Glass bottles are used in the delivery of milk by all the best dairy establishments. Those outside the city fill the bottles at the producing farms. No milk is pasteurized. Milk retails for about 10 cents per quart throughout the year. Three dairies near the city are conducted in a very satisfactory manner, their milk selling at the regular rate. The number of herds of milch cows within the city is not known, but about 15 dairy farms send milk into the city. Practically all the milk used is produced within a radius of 5 miles.

The city has no ordinance regulating the milk supply and no work has been done along this line.

Recent improvements are due to the introduction of high-grade cattle, better water supply at dairies, and more care in the conduct of the dairy business. Milk ordinances are very much needed.

Augusta. (Population, 39,441.)

[For comparison with other cities in Class III, see p. 34.]

Thomas D. Coleman, M. D., secretary of the board of health.

The average amount of milk sold daily is estimated as 600 gallons, or 0.12 pint per capita. In explanation of this apparently low per capita consumption of milk, it is stated that many families keep 1 or 2 cows, and that the milk from these is not included in the above estimate. Milk is sold from 1 store and 30 wagons. Nearly all the dairymen use glass bottles in the delivery of milk, and these are filled at the farms. No milk is pasteurized. The retail price of milk is 4 to 6¼ cents in summer, and 6¼ to 7½ cents in winter. There are no "model dairies" near the city. Dairy herds are not allowed in the city. Milk is sent in from about 20 dairy farms, the most distant being 6 miles from the city.

The city conducts no inspection of the milk or herds.

HAWAII.

Laws of 1898, act No. 34, refers to foods. It forbids the sale of any adulterated food, which term is defined at length and so as to include impure milk.

Honolulu. (Population, 39,306.)

[For comparison with other cities in Class III, see p. 34.]

Edmund C. Shorey, food commissioner for Hawaiian Territory.

About 1,000 gallons of milk is sold daily by milkmen, or 0.20 pint per capita, besides 12 gallons of cream. No skimmed milk is sold as such. In explanation of the small amount of milk reported, it is stated that some private families keep cows and sell milk to their neighbors, and that canned condensed milk instead of natural milk is used largely by native Hawaiians, Asiatics, and others. Milk is sold from

30 wagons, and cream is sold from 3 stores. Glass bottles are used in the delivery of most cream sold, but not for milk. No milk is pasteurized, but a small quantity of cream is thus treated, and the practice is increasing. Some sterilized cream comes from California. The retail price of milk is 10 to 15 cents per quart throughout the year, and of cream 50 to 60 cents per pint. Producers of milk in all cases retail their own product. No dairy near the city is conducted in an entirely satisfactory manner. Thirty-seven herds, including about 900 cows, and located within 6 miles from the center of the city, furnish the milk supply; one herd more distant supplies milk and cream to steamships.

No milk standard has been fixed by law, but the minimum obtained by numerous analyses is used for comparison in prosecutions. License fee for selling milk is $2.50.

In the supervision of its milk supply the city expended last year $1,660—$700 to the food commissioner, or one-third of his salary, $900 to the milk inspector, and $60 for laboratory expenses. The milk inspector gives his entire time to this work. During the past year 700 samples of milk were examined for composition by the lactometer and Babcock test, and in suspicious cases by gravimetric analyses (very few samples were examined in January and February on account of an epidemic of plague); no samples were examined bacteriologically; 10 herds were tested with tuberculin. Milk has been found to contain as high as 40 per cent of added water. In the year there were 11 prosecutions for the sale of adulterated milk, resulting in 9 convictions with fines from $25 to $100. The milk inspector's analyses of herd milk known to be pure showed an average of 12 per cent solids, 3.5 per cent butter fat, minimum solids 11 per cent, and minimum fat 2.5 per cent. Dairy work is often conducted in a very crude manner; many of the employees are Japanese or Portuguese, and ignorant of modern methods. It is a common practice to allow the calves being raised to suckle the cows. The calf is usually allowed to take the last of the milk, which is the richest in fat. A number of analyses of herd milk, showing the results of allowing the calves to take the first or last portion of the milk in the udder, or none at all, are as follows:

Part of milk taken by calves.	Total solids.	Butter fat.
When the calves took the first part of the milk	13.2	4.6
When the calves were allowed to have none	12.8	4.0
When a few calves took the last part of the milk	12.5	3.6
When a large number took the last part of the milk	11.5	2.8

Recent improvement in the milk supply is due to less adulteration with water and better care of milk utensils, the latter resulting in less sour and ropy milk. It is stated that a milk standard should be fixed, and information regarding the care of cows and milk should be distributed to dairymen.

IDAHO.

Revised Statutes of 1897—section 6918 refers to foods. The adulteration of any article of food or drink with fraudulent intent, or sale of same as unadulterated, is a misdemeanor.

ILLINOIS.

Alfred H. Jones, State food commissioner, Chicago.

Laws of 1879, page 111, and 1897, page 268, refer to milk. Cows producing market milk must not be kept in an unhealthy condition, nor shall any person (knowingly) give them unwholesome food, which includes "distillery waste, usually called 'swill,'" and other substances in a state of putrefaction. It is unlawful to sell milk or cream adulterated by the addition of water or any foreign substance. The milk standard is 12 per cent solids, 3 per cent fat. Skimmed milk shall be sold as such in any city and only from cans plainly labeled. Persons retailing milk in cities shall have plainly marked on each can and vehicle the name of the owner and the name of the locality where the milk is produced. Condensed milk shall be made from milk containing at least 3 per cent of butter fat and evaporated to one-third or less of original volume; the word "cream" on cans is evidence of fraud; condensed skimmed milk must be labeled. The addition of sugar to condensed milk is permitted. Canned goods must be labeled to show grade and name of manufacturer.

Laws of 1899, page 368, refer to the State food commissioner. It is his duty to enforce all dairy laws, to inspect foods believed to be unhealthful or adulterated, and to prosecute for their sale. State's attorneys assist in prosecutions. This law forbids the sale of foods that are adulterated, which term is defined at length, and under its authority the commissioner has announced the following standards: Milk, 3 per cent fat; "coffee cream," 15 per cent fat; "whipping cream," 22 per cent fat.

Chicago. (Population, 1,698,575.)

[For comparison with other cities in Class I, see p. 26.]

Thomas F. Grady, superintendent of milk inspection, board of health.

Adolph Gehrmann, M. D., director of laboratory, board of health.

It is estimated that 169,465 gallons of milk are used daily. This is equivalent to a supply of 0.8 pint per capita, but it is probable that this does not represent the average per capita consumption because a considerable quantity of the milk is used in the manufacture of oleomargarine, and much is consumed daily in the city by persons not included in its stated population. The amounts of skimmed milk and cream are not known. There are 4,629 firms engaged in selling milk; 2,162 of these sell from licensed stores, 1,867 sell from 2,692 licensed wagons; and 600 parties sell milk from their own cows. About one-third of the milk peddlers use glass bottles for a part of their trade and only 49 of these sterilize the bottles. Over 115,000 quarts of bottled milk come into the city each day, half of it being supplied by a single firm. Only two concerns fill all of their bottles in the country. Pasteurized milk is used but little, and it is not gaining in favor. The retail price per quart of milk is 5 to 7 cents in the summer and 6 to 7 cents in the winter season, the producers on the farms being paid in the two seasons 2½ cents and 3½ cents, respectively.[a] The milk from

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[a] The Milk News is responsible for the following table, which shows a considerable increase in the price paid to milk shippers. The figures were compiled from shippers' books and office records and represent the price prevailing the longest time in each month. Prices given are for 8-gallon cans delivered on the Chicago platform, freight prepaid:

Month.	1894-95.	1895-96.	1896-97.	1897-98.	1898-99.	1899-1900.
May	$0.55	$0.60	$0.65	$0.65	$0.65	$0.75
June	.55	.60	.65	.65	.65	.75
July	.60	.65	.75	.70	.75	.85
August	.65	.65	.75	.75	.85	.85
September	.70	.70	.75	.80	.90	.95
October	.85	.70	.80	.85	.90	.95
November	.90	.85	.85	1.00	1.15	1.15
December	.90	.87	.80	1.00	1.10	1.15
January	.80	.90	.80	1.00	1.00	1.10
February	.80	.90	.75	.80	1.00	1.10
March	.75	.75	.70	.80	.90	.95
April	.70	.70	.70	.80	.90	.90

two dairies near Chicago, which are conducted in an entirely satisfactory manner, is sold throughout the year for from 7 to 12 cents per quart. Within the city limits there are 30 dairy herds, including 420 cows, besides 1,830 cows kept privately, 1, 2, or 3, in a place. The amount of milk produced by the city cows is 4,500 gallons daily. Milk is sent into the city from 4,000 dairy farms, and about 97 per cent of their product is shipped in over 16 railroads, the longest shipment being 123 miles. The charge for hauling an 8-gallon can of milk varies from 8 to about 22 cents.

Sections 933–965 of the municipal code relate to the city milk supply. Among their provisions are the following: A milk and food division is created in the department of health, the chief officer being known as the superintendent. He and his first assistant must each give bond for $5,000, and each inspector must give bond for $2,000. The officers are supplied with badges and are given necessary authority for making inspections. No inspector is allowed to serve in one district longer than four consecutive weeks, at the end of which time he can not again serve there until he has served in at least two other districts. Licenses, to be renewed the first of each May, must be obtained by milk or cream sellers (excepting persons owning 1 or 2 cows, and hotels, restaurants, etc., where milk or cream is furnished with meals); the fee is $10 for each store and each wagon. Licenses will be granted for a portion of the year at a proportionate rate. They must be displayed in stores, and delivery wagons must bear metal signs obtained from the city clerk showing that they have been licensed. The milk standard is 12 per cent total solids, 3 per cent butter fat; cream standard 15 per cent butter fat; skimmed milk may be sold if plainly labeled by means of a metallic tag; buttermilk is allowed if pure. Condensed milk must be made from pure milk and be in packages plainly labeled to show by whom condensed. The ordinance prohibits the sale of milk or cream for human food which is unclean, impure, adulterated by the addition of water or any foreign substance; milk or cream from diseased cows, cows within fifteen days before and twelve days after parturition, cows kept in an unhealthy condition or fed distillery or brewery refuse or other fermented food; milk or cream exposed to infection from diseased persons or animals. Impure milk and cream, including the product of diseased cows or cows fed on refuse, etc., shall be confiscated when found. Cow stables (in the city?) shall be washed out and thoroughly cleaned each week. Milk vessels, refrigerators, and all places where milk is stored must be kept scrupulously clean.

The ordinance sections regarding qualifications, requirements, and duties of milk-inspection officials are given in Appendix I (p. 177).

The ordinance section referring to signs on delivery vehicles is given in Appendix I (p. 177).

The city expends annually in the supervision of its milk supply about $10,000, and 7 officials—1 superintednent, 5 inspectors, and 1 milk tester—give their entire time to this work. During the past year 19,053 samples of milk and cream were examined by the Babcock test and lactometer and some of them by gravimetric analysis, and 126 samples were examined, upon requests of citizens, for tubercle bacilli. "Of the 19,053 samples of milk and cream analyzed 4,926 were brought to the laboratory by private individuals (the remaining 14,127 were collected by the milk inspectors). Of the 14,127 inspectors' samples 1,813 where tagged skimmed milk and 7,970 were not tagged, therefore sold for whole milk; of these, 859 were found below grade. Out of 4,344 samples of cream, 154 were found below grade. Percentage of inspectors' samples of milk and cream below grade, 7.17. Of the 4,926 samples brought to the office by private individuals, 3,107 were milk, of which 328 were below grade, and 1,813 were cream, of which 104 were below grade. Percentage of samples of milk and cream brought to office found below grade, 8.77. Percentage below grade, all sources, 7.58.[a] The numbers of examinations made each month, with their results, are shown in the table following. The daily records of the examinations of milk are kept on forms similar to this table:

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[a] In a report of the department of health it is shown that the percentage of milk samples found below grade in the last eight years has been as follows:

	Per cent.		Per cent.
1893	45.4	1897	5.8
1894	35.7	1898	6.2
1895	27.7	1899	7.9
1896	5.2	1900	7.6

Commissioner Reynolds calls attention to the fact that in this period there has been a decided decrease in the mortality of infants.

Milk report for the year ended December 31, 1900, Chicago, Ill.

Month.	Total examinations milk and cream (all sources).	Inspector's samples.														Brought to office.										
		Total milk and cream.	Milk.						Cream.			Color.	Water.	Preservatives.	Condensed.	Total milk and cream.	Milk.			Cream.			Color.	Water.	Preservatives.	Condensed.
			Tagged.			Not tagged.																				
			Number.	Low in fat.	Up in fat.	Number.	Low in fat.	Up in fat.	Number.	Low in fat.	Up in fat.						Number.	Low in fat.	Up in fat.	Number.	Low in fat.	Up in fat.				
January	1,237	723	70	39	31	412	42	370	245	10	235	6	11	0	0	514	325	41	284	189	8	181	0	0	0	0
February	1,331	958	122	68	54	587	56	531	306	18	288	23	15	0	4	373	244	37	207	127	23	104	0	0	0	13
March	1,889	1,485	184	112	72	846	90	756	455	25	430	28	18	33	54	404	240	37	203	164	29	135	10	12	30	17
April	2,358	1,906	229	168	61	1,071	92	979	610	13	597	4	12	77	0	452	304	58	246	148	10	138	2	8	113	0
May	2,018	1,584	186	139	47	933	84	849	493	4	489	0	3	60	18	434	255	20	235	172	4	168	0	4	33	5
June	2,083	1,593	161	101	60	964	120	844	458	10	448	0	8	46	0	490	370	26	294	170	2	168	0	10	26	0
July	2,052	1,607	191	136	55	948	90	858	468	14	454	0	60	35	0	445	277	20	257	168	1	167	0	29	8	0
August	1,706	1,395	208	124	84	748	103	645	439	10	429	0	113	8	4	311	208	6	202	103	1	102	0	11	6	7
September	1,462	1,072	176	186	70	542	88	454	354	24	330	0	38	15	8	390	264	24	240	126	6	120	0	10	16	1
October	671	310	58	42	16	141	21	120	111	7	104	0	4	4	4	361	318	17	196	148	8	140	0	6	6	3
November	947	578	87	40	47	286	33	253	205	9	196	0	3	10	14	369	220	26	194	152	5	147	0	12	6	4
December	1,299	916	141	80	61	492	40	482	283	10	273	2	13	5	9	383	237	16	221	146	7	139	0	13	4	1
Total	19,058	14,127	1,813	1,155	658	7,970	859	7,111	4,344	154	4,190	63	298	293	115	4,926	3,107	328	2,779	1,813	104	1,709	12	116	248	51

Inspection of premises in the city where milk is handled shows the following:

Condition of premises.	Stores.	Peddlers' premises.	Premises where cows are kept.
Good sanitary condition	1,100	839	194
Fair sanitary condition	1,043	929	411
Bad sanitary condition	10	90	48
Not reported upon	9	9	45
Total	2,162	1,867	698

There were during the year 618 prosecutions—99 for selling milk or cream below standard and 519 for selling without license; 357 were settled by the payment of costs, and 176 by fines of $25 or more. All of the dairy herds within the city and 11 of the 4,000 outside have been inspected during the past year.

The form for application for milk license is shown in Appendix IV (p. 188).

Recent improvement in market milk is shown by its larger average fat content than formerly and the decreasing use of preservatives. Recommendations as given include a thorough system of dairy inspection with the assistance of State authorities, the registration of dairies and certification as to their sanitary condition, the use of the tuberculin test, and frequent instead of occasional or no inspections.

Peoria. (Population, 56,100.)

[For comparison with other cities in Class II, see p. 30.]

F. C. Bourscheidt, M. D., commissioner of health.

The daily consumption of milk is estimated as 5,000 gallons, or 0.71 pint per capita, besides 500 gallons of skimmed milk and 450 gallons of cream. Milk is sold from 45 stores and 80 wagons. Glass bottles are used in the delivery of milk from 6 or 8 establishments, the greater part of these being filled at the producing farms. No milk is pasteurized. The retail price of milk is 5 to 6 cents per quart in summer, and 5 to 7 cents in winter, the producers receiving 3 cents per quart in summer and 3½ cents in winter. There are no "model dairies" in or near the city. There are 23 dairy herds, including 446 head, within the city limits, and 78 dairy farms, with 1,262 cows, send milk into the city. About 200 gallons of cream is shipped into the city by railway, the longest shipment being 50 miles.

An ordinance adopted October, 1899, refers to milk. License fee for selling milk is $5. The board of health may require the examination of all cows whose milk comes to the city, the owner paying 25 cents per cow. Milk from cows that are diseased, etc., milk from a place where a contagious disease exists, or adulterated milk, is prohibited. Milk standard, 12 per cent solids, 3 per cent fat; cream standard, 25 per cent solids, two-thirds of which must be fat. Skimmed milk must be labeled.

Fifteen hundred dollars is expended annually in the supervision of the milk supply. The commissioner and one assistant give a part of their time to this work. During the past year 655 samples of milk and 115 samples of cream were examined by the Babcock test; 35 samples were examined bacteriologically; all dairy herds in the city and 73 of the 78 dairy farms were inspected.

Quincy. (Population, 36,252.)

[For comparison with other cities in Class III, see p. 34.]

William Hild, secretary of the board of health.

The daily consumption of milk is estimated as 1,500 gallons, or 0.33 pint per capita, besides 1,000 gallons of skimmed milk and 500 gallons of cream. This is sold from

30 stores and 20 wagons. Glass bottles, filled at the producing farms, are used by 3 dairies. Very little milk is pasteurized, and the practice seems to be increasing. Milk is retailed at 5 cents per quart throughout the year, and is supplied from 20 dairy farms, all within 5 miles of the city.

There is no supervision of the city milk supply.

Springfield. (Population, 34,159.)

[For comparison with other cities in Class III, see p. 34.]

Frank N. Patterson, sanitary inspector.

Estimated average daily consumption of milk is 2,500 gallons, or 0.59 pint per capita. Milk is sold from 4 stores and 48 wagons. Within the city limits there are 7 herds, including 63 cows, and milk is sent in from 28 dairy farms. About 6 per cent is received by rail, the longest shipment being 20 miles.

An ordinance adopted in July, 1897, regulates the milk supply. The health officer or sanitary inspector must make a thorough inspection of conditions existing at all premises where milk is sold. Annual license fee is $5, but "private persons" keeping 1 or more cows, and who sell to their customers by peddling same by hand, are exempt from license fee. Each milk wagon must bear a painted metal plate, furnished with the license. Adulterated milk or cream is prohibited. The milk standard is 12 per cent solids, 3 per cent fat; cream standard, 15 per cent fat. Skimmed-milk containers must be tagged with a metal plate, 3 by 5 inches in size. Hotel keepers, restaurant keepers, and boarding-house keepers are subject to the provisions of this ordinance, except the obtaining of a license.

During the past year 389 samples of milk were examined by lactometer and Babcock test; no bacteriological examinations were made; all the city herds, and 13 of the 28 dairy farms, were examined.

Rockford. (Population, 31,051.)

E. W. Brown, mayor.

This city has no milk inspector, and there is no supervision of its milk supply.

East St. Louis. (Population, 29,655.)

M. M. Stephens, mayor.

This city has no milk inspector, and information regarding its milk supply is not available.

Joliet. (Population, 29,353.)

[For comparison with other cities in Class III, see p. 34.]

John R. Casey, M. D., health commissioner.

The daily consumption of milk is estimated as 2,400 gallons, or 0.65 pint per capita, besides 15 gallons of cream. No skimmed milk is sold. Milk is sold from 8 stores and 55 wagons. Very little milk is delivered in glass bottles, and these are filled, some at the farms and some in the city. Only two dealers pasteurize milk and the practice is not increasing. The retail price is 5 cents per quart throughout the year, producers receiving 2½ cents. There is no herd near the city conducted in an entirely satisfactory manner. There are no city herds of milch cows. Milk is brought in wagons from 40 dairy farms within 5 miles of the city.

A city ordinance, May, 1897, requires dairymen to furnish to the health commissioner a description of all their milch cows, a sample of milk obtained therefrom, and a sample of the water used in washing milk cans, etc. All the herds must be tested with tuberculin. The milk standard, as given by the health commissioner, is 3 per cent fat; specific gravity, not less than 1.028.

Nothing is appropriated especially for the supervision of the milk supply. During the past year 300 samples of milk were examined by the lactometer, and all the dairy farms were inspected.

It is recommended that all cows should be subjected to the tuberculin test.

Aurora. (Population, 24,147.)

[For comparison with other cities in Class IV, see p. 40.]

J. W. MacDonald, health officer.

The daily consumption or milk is estimated as 1,500 gallons, or 0.50 pint per capita, besides 100 gallons of skimmed milk and 50 gallons of cream. Milk is sold from 14 stores and 43 wagons, and about three-fourths of it is delivered in glass bottles, which are filled in the city. About 10 per cent of the entire amount is pasteurized, and this practice is increasing. The retail price of milk is 5 cents per quart throughout the year, producers receiving 2¼ and 3 cents, summer and winter, respectively. The milk from one "model dairy" near the city is sold for 12 cents per quart. Within the city there are 2 herds, including 40 cows, and milk is sent in from about 100 dairy farms, the most distant being 8 miles from the city.

An ordinance of November, 1897, consisting of 21 sections, refers especially to milk. Another ordinance, relating to food and drink, refers in general terms to milk. License for the sale of milk or cream is $5; each wagon after the first, $5; but persons owning not more than 2 cows are exempt. Impure, adulterated, etc., milk is prohibited. The milk standard is 12 per cent milk solids, 3 per cent fat; cream standard, 15 per cent fat. Condensed milk must be from pure milk and contain the right proportion of milk solids and fat. Skimmed milk must be labeled. Buttermilk is permitted if made from pure milk. Milk premises, utensils, etc., must be kept clean. Milk wagons must bear metal sign. Cows must be given pure food and water.

About $300 is expended annually in the supervision of the milk supply, one official giving a part of his time to this work. During the past year 314 samples were examined by lactometer and Babcock test; 15 samples were examined bacteriologically for tubercle bacilli; the city herds, but none of the dairy farms, were inspected.

Recent improvement is due to greater cleanliness obtaining at dairies and to the practice of pasteurizing. It is stated that all cows should be tested for tuberculosis and all dairies as to sanitary condition, and there should be a more frequent inspection of the milk.

Evanston. (Population, 19,259.)

[For comparison with other cities in Class IV, see p. 40.]

William R. Parkes, M. D., health commissioner.

The daily consumption of milk is estimated as 1,500 gallons, or 0.62 pint per capita. Milk is sold from 10 stores and 40 wagons, there being 23 dealers. Glass bottles, filled in the city, are used almost universally in the delivery of milk. No milk is pasteurized. The retail price is 6 cents in summer and 7 to 10 cents in winter, producers receiving 4 cents and 5 cents in the two seasons. The milk from two dairies, conducted on a better plan than others, is sold for 8 cents per quart in summer and 10 cents in winter. Within the city limits there are 7 herds, including 400 cows, and milk is sent in from 37 dairy farms. About 35 per cent is received by railway, the longest shipment being 75 miles.

City ordinances, Chapter XLVI, sections 653–681, refer to milk. License fee for the sale of milk or cream is $5 for each store and wagon; each additional wagon, $2. This does not apply to persons who own 1 or more cows and peddle milk to their neighbors. Impure, adulterated, etc., milk is prohibited. The milk standard is 13 per cent solids, 3 per cent butter fat; the cream standard is 15 per cent butter fat.

Skimmed milk must be labeled. Condensed milk and buttermilk must be from pure milk. Milk from diseased cows may be confiscated. Cow stables must be washed out at least once a week.

The health officer and the sanitary inspector give a part of their time to the supervision of the milk supply. During the past year 40 samples of milk were examined by the lactometer, Babcock test, and gravimetric analysis. No bacteriological examinations were made. All the city herds and 25 of the 37 dairy farms were inspected. Four herds were subjected to the tuberculin test and 6 cows were condemned.

It is stated that all tubercular cows should be disposed of, and the tuberculin test should be used for their detection.

Moline. (Population, 17,248.)

[For comparison with other cities in Class IV, see p. 40.]

Ed. Kittilsen, city marshal and health officer.

The daily consumption of milk is estimated as 577 gallons, or 0.27 pint per capita. Milk is sold from 1 store and 34 wagons, and a part of it is delivered in glass bottles, filled at the farms; none is pasteurized. The retail price is 5 cents per quart throughout the year, producers receiving 3 cents. There are no "model dairies" near the city. Within the city limits there is 1 herd (30 cows), and milk is sent from 30 dairy farms. The longest shipment of milk by railway is 10 miles.

The city has no milk ordinance.

During the past year 332 samples of milk were examined by the Babcock test, and 24 of the 30 dairy farms were inspected.

Ottawa. (Population, 10,588.)

[For comparison with other cities in Class IV, see p. 40.]

W. F. Weese, V. S., acting dairy inspector.

The daily consumption of milk is estimated as 600 gallons, or 0.45 pint, per capita. Milk is sold from 15 wagons, but from no stores. About one-fourth of it is delivered in glass bottles, which are filled at the farms; none is pasteurized. The retail price is 5 cents per quart in summer and 6 cents in winter, producers receiving 2½ and 3 cents in the two seasons. There are no "model dairies" near the city. Within the city limits there are 3 herds, including 25 cows, and milk is supplied from 13 dairy farms, all within a radius of 4 miles.

Revised ordinances adopted in June, 1899, and August, 1899, refer to milk. License fee for the sale of milk or cream is $1 for each cow. Cows must be free from contagious and infectious disease. Provision is made for the use of the tuberculin test.

Four hundred dollars is expended annually in the supervision of the milk supply, one official giving a part of his time to this work. During the past year 13 samples of milk were examined by the lactometer and Babcock test; no bacteriological examinations were made; all the city herds and 11 of the 13 dairy farms were inspected.

Recent improvements in the milk supply include an increase in the butter fat content, greater cleanliness in handling, and the removal of all tuberculous cows from dairy herds. Needed improvements stated include the enforcement of more stringent sanitary measures at the producing farms and the more frequent testing of milk.

INDIANA.

J. N. Hurty, M. D., secretary of the board of health, Indianapolis.

Horner's Revised Statutes, 1897—section 2071 refers to milk. It is unlawful to knowingly sell milk that is adulterated or skimmed, or milk from a cow that is diseased or fed upon deleterious foods, including the refuse of a distillery or brewery.

Acts of 1899—chapter 121 refers to foods. Its enforcement is charged to the State board of health. It forbids the sale of adulterated food, which is defined at length, and under its authority the State board of health has established the following standards and rules: Milk shall contain at least 3 per cent fat, 9 per cent other solids; no coloring matter or antiseptic is permitted; it shall not be sold when taken less than twenty-one days before or four days after calving, nor when from a cow that is diseased or fed upon damaged food.

The board of health has issued rules describing in detail conditions which should be found and methods which should be followed at dairies.

As no appropriation has been made for the enforcement of the food law, the State board of health has been unable to take action under its authority.

Indianapolis. (Population, 169,164.)

[For comparison with other cities in Class I, see p. 26.]

A. F. Zearing, clerk of the board of public health.

The daily consumption of milk is estimated as 12,000 gallons, or 0.57 pint per capita. It is estimated also that 8,000 gallons of skimmed milk and 4,000 gallons of cream are consumed daily. Milk is sold from 770 stores and 273 wagons. Glass jars are used almost exclusively in its delivery, and these are filled both on the farms and in the city. A small amount of milk is pasteurized and this treatment is increasing in favor. The retail price per quart is 5 cents in summer and 6 cents in winter, and the producers receive 2¼ and 3 cents in the two seasons. A large portion of the dairies are conducted in a very satisfactory manner. Twenty-five herds, including 180 milch cows, are within the city limits, and 250 dairy farms send milk into the city. Five per cent of the total supply is received by rail, the longest shipment being 40 miles.

Dairies must be licensed and observe certain regulations adopted by the board of public health and charities, January, 1896, under authority of ordinance No. 71, December, 1895. License fee for sale of milk is 50 cents. The regulations require that dairy stables be constructed and the work be conducted in a sanitary manner; the requirements are detailed, some of them being: All animals except dairy stock must be excluded from the stable or milk room; each cow must be allowed 500 cubic feet air space; each cow must be cleaned daily and be properly fed and watered; cans must be scalded daily; milk must be strained and cooled to 58° F. promptly after milking; no milk must be used from cows sixty days before or twelve days after calving; the board of health must be promptly notified of the discovery of disease; and the tuberculin test may be required on suspected cows, etc. The milk standard is 9 per cent solids not fat, 3 per cent fat.

Regulations governing dairies are shown in Appendix I (p. 171).

One thousand dollars is appropriated annually for the supervision of the city milk supply, and one inspector gives his entire time to this work. During the past year 850 samples of milk were examined by lactometer, Babcock test, and gravimetric analysis; 14 samples were examined bacteriologically, and the city milch cows and 204 of the 250 dairy farms were inspected.

The superior quality of the milk supply of Indianapolis is due in no small measure to a plan put in operation by the health officials a few years ago whereby the dairymen who kept their dairies up to the highest standard received special certificates of approval. These were helpful in obtaining new trade and were therefore generally sought after, with the result that sanitary methods were introduced into many places where they would not otherwise have been found.[a]

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[a] Market Milk: A Plan for its Improvement. Seventeenth An. Rpt. Bu. An. Ind., pp. 158–193.

The most marked recent improvement has resulted from prosecutions for the use of formaldehyde[a] as a preservative, and in compelling greater cleanliness in the handling of milk.

Evansville. (Population, 59,007.)

[For comparison with other cities in Class II, see p. 30.]

J. H. Kerth, milk and food inspector.

The daily consumption of milk is estimated as 2,500 gallons, or 0.34 pint per capita. Milk is sold from 3 stores and 60 wagons. In the delivery of milk glass bottles are used by two dairy establishments. One of these fills the bottles in the city, the other at the producing farm. No milk is pasteurized. The average retail price of milk is about 6¼ cents per quart throughout the year. There is one well-conducted dairy near the city, but it receives no advance in price for its product. Within the city limits there are 5 herds of milch cows, including 60 head, and 54 dairy farms send milk into the city. No milk is shipped in by railway, the supply coming by wagons as far as 9 miles.

Ordinance No. 31, October, 1893, regulates the milk supply. License to sell milk is granted free of charge. Unwholesome or adulterated milk, "swill milk," and milk from unhealthy cows is prohibited. The inspector must inspect at least once a month all dairies, including cows, milk, vessels, etc.

Nine hundred dollars is expended annually in the supervision of the milk supply. One officer, as milk and food inspector, gives his entire time to this work. During the past year 215 samples of milk were examined by lactometer, the Babcock test for fat, and by a qualitative test for formaldehyde; no bacteriological examinations were made; all of the city herds and all the dairy farms were inspected.

Recently the sale of milk containing preservatives has decreased and greater cleanliness has obtained in the production of milk.

Suggested improvements as given, include a higher milk standard and a more frequent inspection of dairies and dairy products.

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[a] Regarding the use of formaldehyde as a preservative in milk, the following statement, attributed to Dr. Morrison, health officer of Indianapolis, is reprinted:

> My experiments were undertaken by reason of some prosecutions here for the sale of adulterated milk. Total number of experiments, 96; preservative, formaldehyde. Milk was secured direct from the cow and immediately transferred to test tubes. In each test tube was placed 6 c. c. of this milk. The tubes were placed upon racks in rows, each row containing a "control" tube, five tubes in each row, so that the average result could be obtained..
>
> In row No. 1, pure milk; all other rows, one pure and four adulterated. To one row was added artificial gastric juice, prepared from Fairchild's pepsin. Exactly the same in same amounts applied to each of the tubes in other rows. Previous to putting in the digestive material, however, four tubes in each row were adulterated as follows: Second row, quantity equal to 9 drops of a 40 per cent solution of formaldehyde for each gallon of milk, and decreasing the per cent in each row until the last had an amount equal to one drop per gallon.
>
> The first effect noted was that the coagulation which normally occurs in milk upon the addition of "rennin" in the ordinary commercial pepsin, was slightly retarded, the retardation being directly proportionate to the amount of formaldehyde used. When coagulation did occur the coagulum was tough in proportion to the amount of formaldehyde present, proving to my satisfaction that the coagulum formed by the digestive juice in the presence of formaldehyde was an exceedingly tough one. Next, tubes were placed in an incubator, kept there at a temperature of 100° F. for 8 hours and then examined. I give briefly the result without burdening with weights of undigested residue, etc.: Pure milk in all tubes, fully digested; where large amounts of formaldehyde were present absolutely no digestion. When the amount of formaldehyde present approached three drops to the gallon, digestion commenced and gradually increased as the porportion of the preservative decreased, but in the presence of one drop to the gallon the inhibitory action upon digestion could be seen.

Fort Wayne. (Population, 45,115.)

[For comparison with other cities in Class III, see p. 34.]

L. Park Drayer, city sanitarian.

The daily consumption of milk is estimated as 2,480 gallons, or an average of 0.44 pint per capita. Milk is sold from 15 stores and 106 wagons. Within the city limits there are 297 cows in 175 stables, and milk is brought to the city in wagons from 84 dairy farms, the lóngest haul being 8 miles.

General ordinance No. 128 regulates the milk supply. License fee for the sale of milk or cream is $1. The city bacteriologist is placed in charge of the milk division of the department of health. Adulterated, etc., milk or cream is prohibited. Boarding-house keepers, etc., furnishing milk or cream are subject to the provisions of this ordinance. The milk standard is 12 per cent solids, 3.5 per cent fat. Cream standard is 18 per cent fat. Skimmed milk containers must be painted red and be plainly labeled. Buttermilk must be from pure milk or cream. It is the duty of an officer of the board of health to examine as often as necessary all stables where cows are kept.

Ordinance section regarding delivery of skimmed milk is given in Appendix I (p. 179).

During the past year 700 samples of milk were examined by the Babcock test; no bacteriological examinations were made; all the city herds and all the dairy farms were inspected.

Terre Haute. (Population, 36,673.)

[For comparison with other cities in Class III, see p. 34.]

C. O. Elliott, city inspector.

The daily consumption of milk is estimated as 1,000 gallons, or 0.22 pint per capita, besides 40 gallons of skimmed milk and 30 gallons of cream. Milk is sold from 9 stores and 25 wagons. Fifty per cent of the dairies supply milk in glass bottles, filled at the farms. A large quantity of milk is pasteurized, and the practice is increasing. Milk is retailed at 5 cents per quart throughout the year, the producers receiving 3½ cents. The milk from one "model dairy" near the city is sold regularly for 10 cents per quart. Thirty-four dairy farms send milk into the city. Only a very little milk is received by railway, the longest shipment being 30 miles.

About $1,200 is expended annually in the supervision of the milk supply, one official giving his entire time to this work. During the past year 500 samples were examined by the lactometer and Babcock test and were tested for preservatives, and all the dairy farms were inspected.

South Bend. (Population, 35,999.)

[For comparison with other cities in Class III, see p. 34.]

C. M. Butterworth, commissioner of health.

The daily consumption of milk is estimated as 1,000 gallons, or 0.22 pint per capita. Milk is sold from 35 wagons. About one-third of the milk is delivered in glass bottles, filled at the producing farms. No milk is pasteurized. The retail price of milk is 5 cents per quart in summer and 6 cents in winter. There are no "model dairies" near the city. There are no dairy herds within the city limits. Milk is sent in from 25 dairy farms. About 2 per cent is received by railway, the longest shipment being 15 miles.

During the past year 28 samples were tested for preservatives; no bacteriological examinations were made, and no herds were inspected.

Richmond. (Population, 18,226.)

[For comparison with other cities in Class IV, see p. 40.]

George G. Ferling, V. P. S., dairy inspector.

The daily consumption of milk is estimated as 1,250 gallons, or 0.55 pint per capita. Milk is sold from about 15 stores and 39 wagons, and one-third of it is delivered in glass bottles, filled at the farms. Milk is pasteurized at one dairy farm, but the practice is not increasing. The retail price is 5 cents per quart throughout the year. A few dairies near the city are conducted in a better manner than others, but receive no advance in price for their product. There are 4 herds, including 45 cows, within the city limits, and milk is sent from 36 dairy farms, all within 6 miles of the city.

There is expended annually $150 in the supervision of the milk supply, one official giving a part of his time to this work. During the past year 38 samples of milk were examined by the Babcock test, all the city herds were inspected monthly, and all the dairy farms were inspected.

Recently there have been more cleanly methods in dairies and more care in the cooling of milk. Further improvements, as given, include the proper cleaning of stables and cows, a pure water and food supply, and the delivery of milk in bottles.

IOWA.

H. R. Wright, dairy commissioner, Des Moines, successor to B. P. Norton (1903).

Code of 1897, title 12, chapter 13, sections 2522 to 2528, and title 24, chapter 10, sections 4989 to 4991, refer to market milk. They are enforced by the State dairy commissioner. City milk dealers and persons supplying them must keep premises and utensils in hygienic condition and must report statistics to the dairy commissioner. Every person using a milk test shall obtain certified glassware from the dairy commissioner. An agent may be placed in each city of over 10,000 inhabitants to collect and test milk samples. A permit to sell milk must be obtained for each wagon, depot, or store; all permits expire every July 4, and cost $1 annually. The sale of impure or adulterated milk, or milk from a diseased cow or one having ulcers or sores, or milk from a cow within fifteen days before or five days after parturition, is forbidden. No person shall keep cows for production of market milk or cream in an unhealthy place nor shall knowingly give them food which produces impure milk, or feed them distilled glucose or brewery waste in a state of fermentation, or any putrefying or unhealthy substance. The milk standard is 12.5 per cent solids, 3 per cent fat; cream standard, 15 per cent fat. Skimmed milk may be sold as such.

An amendment (General Acts, 1902, chapter 102, section 1), places a penalty on creameries, etc., which do not report statistics to the dairy commissioner.

Inspection is now conducted under the direction of the dairy commissioner in 14 cities. The work of the local inspectors consists entirely of an inspection as to sanitary conditions of milk and the wagons and cans used in its delivery, and the testing of milk and cream samples for fat content. During the last year 784 store and wagon licenses to sell milk were issued, and about 12,000 tests of milk and cream were made by the commissioner's agents; a number of examinations for preservatives were made. Work in 1900 was carried on under difficulties due to adverse court decisions which have since been reversed. The total time expended in their work by the 14 milk inspectors is equivalent to perhaps sixty days a month; they are paid $3 per day for their services.

The form for application for milk license is shown in Appendix IV (p. 190).

Des Moines. (Population, 62,139.)

[For comparison with other cities of Class II, see p. 30.]

B. P. Norton, State dairy commissioner.

The daily consumption of milk is estimated as 5,000 gallons, or 0.64 pint per capita. This is sold from 40 stores and 125 wagons. Ten per cent of the milk is delivered in glass bottles, some of which are filled at the farms and some in the city. No milk is pasteurized. The retail price of milk is 5 cents per quart throughout the year, producers receiving 2 cents per quart in summer and 2½ cents in winter. There are no "model dairies" in or near the city. There are 75 herds, including 1,000 cows, within the city, and 100 dairy farms send milk into the city. A portion of the cream shipped by railway comes a distance of 40 miles.

The city has no milk ordinance and provides no specific fund for the supervision of its milk supply, this work being under State control with an appropriation of $300. One State official gives eight days each month to this work. During the past year about 1,000 samples of milk were examined by the Babcock test; no bacteriological examinations were made.

Recently there has been a decrease in the use of preservatives in milk.

Dubuque. (Population, 36,297.)

[For comparison with other cities in Class III, see p. 34.]

B. P. Norton, State dairy commissioner.

The amount of milk sold daily is estimated as 1,425 gallons, or 0.31 pint per capita, besides 150 gallons of cream. The above estimate does not include the milk from cows kept by private families in the city. Milk is sold from 12 stores and 45 wagons. Very little milk is delivered in glass bottles, and none is pasteurized. The retail price is 5 cents per quart throughout the year, producers receiving 2 cents and 2½ cents in the two seasons. There are no dairies near the city conducted in an entirely satisfactory manner. The milk from 40 dairy farms is brought to the city in wagons, the longest haul being 10 miles.

The city expends nothing in the supervision of its milk supply. The State dairy commission expends annually about $144, one official giving four days of each month to this work. During the past year 5,000 samples of milk were examined by the Babcock test; none of the dairy farms were inspected.

Davenport. (Population, 35,254.)

[For comparison with other cities in Class III, see p. 34.]

C. H. Preston, city physician.

The daily consumption of milk is estimated as 1,400 gallons, or 0.32 pint per capita, besides 500 gallons of skimmed milk and 150 gallons of cream. Milk is sold from 3 stores and 64 wagons. Glass bottles, filled at the farms, are used largely in the delivery of milk. Little if any milk is pasteurized. The retail price of milk is 5 cents per quart throughout the year, the producers delivering their milk at the above price. Within the city limits there are 14 herds, including 239 cows, and milk is brought in wagons from 52 dairy farms within a radius of 6 miles from the city.

An ordinance, passed in December, 1896, refers to milk. Each dairy and dairy herd must be inspected by an officer of the board of health previous to the issuing of a license for the sale of milk therefrom. The tuberculin test is authorized. Inspected animals are tagged.

During the past year $600 (city $400, State $200) was expended in the supervision of the milk supply. One milk and health inspector and one food and dairy inspector give a part of their time to this work. One thousand milk samples were examined by the Babcock test, and five samples by gravimetric analysis; no bacteriological examinations were made. All city herds and dairy farms were inspected twice. Although there is no "model dairy" near the city, it is stated that all dairies "are conducted with care under inspection."

Recently dairies have improved in cleanliness, and the use of bottles has increased. It is stated that the milk supply might be further improved if examination of samples could be made in district bacteriological and chemical laboratories established by the State.

Sioux City. (Population, 33,111.)

[For comparison with other cities in Class III, see p. 34.]

O. P. McCray, agent of the dairy commission.

The daily consumption of milk is estimated as 4,500 gallons, or 1.09 pints per capita. Milk is sold from 10 stores and 46 wagons. Glass bottles, filled at the producing farms, are used to a limited extent in the delivery of milk, and this practice is increasing. No milk is pasteurized. The retail price of milk is 5 cents per quart in summer and 6 cents in winter. There are no "model daries" near the city. Within the city limits there are 41 herds, including 610 cows, and milk is brought in wagons from dairy farms within 6 miles of the city.

The State expends annually about $144 in the supervision of the city milk supply, one official giving a part of his time to this work. During the past year 720 samples of milk were examined by the Babcock test; no bacteriological examinations were made; none of the city herds were inspected.

Council Bluffs. (Population, 25,802.)

[For comparison with other cities in Class III, see p. 34.]

W. A. Groneweg, city milk inspector.

The daily consumption of milk is estimated as 1,600 gallons, or 0.49 pint per capita, besides 50 gallons of skimmed milk and 250 gallons of cream. Milk is sold from 6 stores and 31 wagons. About one-half of the dealers use glass bottles for delivering milk; these are filled both on the farms and in the city, and their use is increasing. Nearly one-third of the milk is pasteurized, but this practice is not increasing. The retail price of milk is 5 cents per quart in summer and 6 cents in winter, the producers receiving 2½ cents throughout the year. There are no "model dairies" near the city. Within the city limits there are 22 herds, including 300 cows, and milk is sent in from 5 (?) dairy farms. One-third of the total supply comes in by railway, the longest shipment being 7 miles.

One official of the State dairy commission gives a part of his time to the supervision of the milk supply. During the past year milk samples were collected and examined by the Babcock test three or four times every month; no bacteriological examinations were made; none of the dairy herds were inspected.

The greatest recent improvement has been in the increased use of glass bottles, which are both convenient and cleanly. It is suggested that all herds, barns, dairy buildings, etc., should be inspected once each month, and that all milk and cream be delivered in bottles, or small cans, so as to avoid unnecessary contamination by dust, etc.

Cedar Rapids. (Population, 25,656.)

[For comparison with other cities in Class III, see p. 34.]

J. W. Griffith, V. S., city milk inspector.

The daily consumption of milk is estimated as 1,500 gallons, or 0.47 pint per capita, besides 400 gallons of skimmed milk and 200 gallons of cream. Milk is sold from 35 stores and 40 wagons. Glass bottles, filled mostly at the farms, are used by one-half of the milkmen. Milk was pasteurized by one dealer, but, on account of the small demand for it, the practice has been discontinued. The retail price is 4 to 5 cents per quart throughout the year, the producers receiving 2 to 3 cents in summer and 3 to 4 cents in winter. There is no dairy near the city which is conducted in an entirely satisfactory manner. Within the city limits there are 8 herds, including 200 cows. No milk is received by railway. The most distant source of supply is 12 miles from the city.

The city expends nothing for milk inspection work, this being done by the State dairy commission, one official giving a part of his time to this work at a cost to the State of $150. During the past year milk samples were examined by the Babcock test; no bacteriological examinations were made, and none of the dairy farms were inspected.

Recently the milk supply has improved, due to greater cleanliness at the producing farms. It is suggested that all milch cows be tested with tuberculin.

Burlington. (Population, 23,201.)

[For comparison with other cities in Class IV, see p. 40.]

W. C. Hummell, health officer and milk inspector.

The daily consumption of milk is estimated as 1,600 gallons, or 0.55 pint per capita. Milk is sold from 1 store and 44 wagons. One firm delivers milk in sterilized glass bottles, which are filled in the city. No milk is pasteurized. The retail price is 5 cents per quart in summer and 6 cents in winter. There are no "model dairies" near the city. Within the city limits there are 50 herds, including 1,200 cows. Milk is sent in from 12 dairy farms, the most distant being 20 miles from the city.

A city ordnance gives the health officer power to prosecute under State law and to prohibit the sale of impure or adulterated milk.

Nothing is appropriated by the city for the supervision of its milk supply, this work being under State control. During the past year 600 samples of milk were examined by the Babcock test; no bacteriological examinations were made; 35 of the 50 city herds, but none of the dairy farms, were inspected.

Needed improvements, as given, include thorough inspections of milk and dairies, such inspections to be made often until the character of the supply is satisfactory.

Clinton. (Population, 22,698.)

[For comparison with other cities in Class IV, see p. 40.]

B. P. Norton, State dairy commissioner.

The daily consumption of milk is estimated as 1,000 gallons, or 0.35 pint per capita, besides 60 gallons of cream. In explanation of this apparently low consumption it is stated that many families keep their own cows and the milk from these is not included in the above estimate. Milk is sold from 10 stores and 30 wagons. Very little milk is delivered in glass bottles, filled at the farms and in the city; none is pasteurized. The retail price is 5 cents per quart throughout the year, producers receiving 2 cents in summer and 2½ cents in winter. There are no so-called "model dairies" near the city. Milk is sent in from 30 dairy farms, the most distant being 10 miles from the city.

The city milk supply is under State supervision. During the past year 4,000 samples of milk were examined by the Babcock test.

Recent improvement is due to the decreased use of preservatives.

Ottumwa. (Population, 18,197.)

[For comparison with other cities in Class IV, see p. 40.]

E. B. Hill, milk agent.

The daily consumption of milk is estimated as 606 gallons, or 0.27 pint per capita, besides 15 gallons of skimmed milk and 12 gallons of cream. In explanation of this small consumption, it is stated that there are 200 cows kept by private families in the city, and the milk from these is not included in the above estimate. Milk is sold from 1 store and 18 wagons. Only a few bottles are used in the delivery of milk, and these are filled at the farms. No milk is pasteurized. The retail price is 5 cents per quart in summer and 6 cents in winter, producers receiving 2½ cents and 3 cents in the two seasons. There are no so-called "model dairies" near the city. Within the city there is one herd (12 cows), and milk is sent in from 20 dairy farms within a radius of 10 miles. About 8 per cent is received by railway.

During the past year 576 samples of milk were examined by the Babcock test; 1 bacteriological examination for typhoid bacilli; 1 of the 20 dairy farms was inspected.

Keokuk. (Population, 14,641.)

[For comparison with other cities in Class IV, see p. 40.]

Frank Harshman, deputy State dairy commissioner.

The daily consumption of milk is estimated as 500 gallons, or 0.27 pint per capita, besides 30 gallons of skimmed milk and 50 gallons of cream. Milk is sold from 20 stores and restaurants and 16 wagons. Glass bottles are not used, and no milk is pasteurized. The retail price is 5 cents per quart in summer and 6¼ cents in winter, producers receiving 4 and 5 cents in the two seasons. There are no "model dairies" near the city. About 500 cows in the city and on 16 dairy farms produce the milk supply. The most distant dairy farm is 4 miles from the city.

About $126 is expended annually as the salary of one State official, who gives a part of his time to this work. During the past year 432 samples of milk were examined by the Babcock test; no bacteriological examinations were made; all city cows and all dairy farms were inspected.

Recent improvement in the milk supply is due to a better grade of cows and more careful feeding.

It is stated that milk should be delivered in bottles filled at the farms.

Marshalltown. (Population, 11,544.)

[For comparison with other cities in Class IV, see p. 40.]

E. M. Singleton, M. D., city milk inspector.

The daily consumption of milk is estimated as 800 gallons, or 0.55 pint per capita, besides 100 gallons of skimmed milk and 20 gallons of cream. Milk is sold from 1 store and 14 wagons, and about one-half of it is delivered in glass bottles filled at the farms; none is pasteurized. The retail price is 4 to 5 cents per quart in summer and 5 to 6 cents in winter, producers receiving 2½ cents per quart. There are no "model dairies" near the city. Within the city there are 2 herds, including 35 cows, and milk is sent in from 12 dairy farms within a radius of 3 miles.

About $110 is expended annually in the supervision of the milk supply as the salary of one State official, who gives a part of his time to this work. During the past year 500 samples of milk were examined by the Babcock test.

It is stated that dairies should be inspected, and that cleanly methods be required.

KANSAS.

General Statutes, 1897, volume 2, sections 322 to 331, refer to milk and food. The sale of adulterated and skimmed milk with intent to defraud, or the sale (knowingly) of the product of diseased animals, is forbidden. It is unlawful to sell food which is adulterated, this term being defined at length.

Kansas City. (Population, 51,418.)

[For comparison with other cities of Class II, see p. 30. See also Kansas City, Mo.]

Jacob S. Heisey, inspector of licenses, weights, measures, and milk.

The daily consumption of milk is estimated as 3,000 gallons, or 0.47 pint per capita, besides 165 gallons of cream. In addition to the above, 4,000 gallons of milk is used daily by six oleomargarine manufacturers. Milk is sold from 100 stores and 75 wagons. Glass bottles are not used in delivering milk. During the summer months fully 80 per cent of the milk is pasteurized. The retail price of milk is 5 cents per quart throughout the year. There are no "model daries" in this vicinity. Within the city limits there are 42 herds, including 1,000 head of cattle. A part of the city milk supply comes 40 miles by railway.

Ordinance No. 3720, August, 1899, refers to milk. Persons selling milk must have permit. Adulterated, diseased, etc., milk is prohibited. Inspector must inspect all dairies and dairy cows within the city limits during the months of April and October, and he may inspect dairies beyond the city limits on payment of $2 each and 5 cents per mile. The milk standard is 12 per cent solids, 3 per cent fat. Condensed milk, buttermilk, sour milk, or skimmed milk must be properly labeled and be from pure, wholesome milk.

Besides expenses borne by the license department, about $100 is paid each year to a veterinary surgeon for assistance in examining herds. No milk samples were examined during the past year, but all the city herds and 10 dairy farms were inspected.

The form for notice which must be sent to the inspector when cows are added to a dairy herd is shown in Appendix IV (p. 199).

Recent improvement has been made in the quality of milk by the introduction of cows producing rich milk.

Topeka. (Population, 33,608.)

[For comparison with other cities in Class III, see p. 34.]

J. P. Farnsworth, city food inspector.

The daily consumption of milk is estimated as 2,000 gallons, or 0.48 pint per capita, besides 50 gallons of skimmed milk and 80 gallons of cream. This is sold from 20 stores and 50 wagons. Five per cent of the milk is delivered in glass bottles, which are filled in the city; none is pasteurized. The retail price is 5 cents per quart in summer and 5 to 6¼ cents in winter, producers receiving 2½ cents in summer and 2½ to 3½ cents in winter. The milk from one "model dairy" near the city is sold for 8⅓ cents per quart and higher. Within the city limits there are 4 herds, including 60 cows, and milk is brought to the city in wagons from 150 dairy farms within a radius of 10 miles.

Ordinances No. 620, of May, 1886, and No. 802, of April, 1888, refer to milk. The food inspector (salary $900) must inspect the milk supply. Persons selling milk must register with the board of health. Adulterated, etc., milk is prohibited. Milk from cows fed on refuse from starch factory, vinegar factory, or glucose factory is prohibited. The milk standard is 12 per cent solids, 3 per cent fat. Skimmed milk must be labeled.

About $1,000 is expended annually in the supervision of foods, the inspector giving a part of his time to the milk supply. During the past year about 400 samples of milk were examined by the Babcock test; no bacteriological examinations were made; all the city herds and nearly all the dairy farms were inspected.

It is stated that the milk supply would be very much improved if producers would not aerate their milk in or near barns.

KENTUCKY.

Acts of 1891, 1892, and 1893, chapter 182, section 144, refer to milk. It is unlawful to knowingly sell milk that is adulterated, or from a diseased cow or from a cow fed upon still slop, brewers' slop, or brewers' grains. Skimmed milk shall not be sold with intent to defraud.

Acts of 1900, chapter 13, refers to foods. It forbids the sale of a food which is adulterated or contains an antiseptic or preservative, unless same is branded "adulterated," and sold for what it is. The State agricultural experiment station may inspect and analyze foods, adulterated products to be reported to the Commonwealth attorney of the district, or county attorney, or city attorney for prosecutions. The director of the agricultural experiment station is empowered to fix standards of purity, etc., and has published the following: Milk, 12 per cent solids, 3 per cent fat; cream, 15 per cent fat; both of these to be free from preservatives or coloring matter.

Louisville. (Population, 204,731.)

[For comparison with other cities in Class I, see p. 26.]

M. K. Allen, M. D., health officer.

The daily consumption of milk is estimated as 10,000 gallons, or 0.39 pint per capita, besides 8,000 gallons of skimmed milk and 50 gallons of cream. Milk is sold from 100 stores and 250 wagons. Possibly one-fourth of the milk is delivered in glass bottles, which are filled on the producing farms. Only a small amount of milk is pasteurized, but the practice is increasing. The retail price of milk is 5 to 6¼ cents per quart throughout the year, producers receiving 3 cents per quart in summer and 3½ cents in winter. There are three or four especially well-conducted dairies near the city which retail their product as high as 7½ cents per quart. Within the city limits there are about 100 herds, including 1,000 cows. There are also about 100 dairy farms sending milk into the city. It is estimated that one-half of the total milk supply is shipped by railway, the longest shipment being 50 miles.

Ordinance No. 108, series 1898, adopted in May, regulates the milk supply. Each person sending milk into the city must have a permit from the health officer, granted in January of each year, free of charge. Permit numbers must be shown on wagons, and names of dairymen supplying milk must be shown in stores, etc., where it is sold. Permit holders must furnish, once every three months, a certificate from a veterinarian to the effect that all his milch cows are free from disease. The tuberculin test may be required in any herd suspected of infection with tuberculosis. Each cow must have 600 cubic feet air space, and all dairy buildings must be well constructed and painted or whitewashed. The standard for milk is 12 per cent milk solids, 3 per cent fat, and a specific gravity not less than 1.029; cream must contain 20 per cent of butter fat. The sale of unwholesome or adulterated milk is prohibited, including milk from cows within fifteen days before or ten days after calving, from cows fed on distillery waste or any fermenting substance or given any unwholesome food or drink, or from cows kept in a crowded or unhealthy condition, milk from which any part of the cream has been removed, and milk to which any foreign substance has been added. Skimmed milk may be sold, if plainly labeled, and if it contains the normal amount of casein and salts. Bottled milk must not be delivered to, nor empty bottles taken from, any dwelling where there is a contagious disease, and no person who has been exposed to a contagious disease shall work in a dairy. Dairy employees must maintain strict cleanliness. Manure must be removed twice daily, one hour preceding each milking. The teats and, if necessary, the udders must be carefully cleaned before milking. All apparatus used in handling milk must be of nonabsorbent material and be kept clean at all times. When milk vessels are filled they shall be promptly removed from the stable and not stored in a room where animals are kept. The health officer must be notified within twenty-four hours after the discovery of a contagious or infectious disease among the cows. Diseased cows must be isolated.

The full text of the milk ordinance is shown in Appendix I (p. 169).

The city does not provide a specific fund for the supervision of the milk supply. Three sanitary inspectors of the health department occasionally give attention to this part of the food supply. During the past year 475 samples of milk were analyzed, and about 25 of the 100 city herds and 25 of the 100 dairy farms were inspected; no bacteriological examinations were made.

Marked improvement has been made in the sanitary condition of the dairies. Further needs, as given, include close attention to the sanitary condition of the dairies, the use of the tuberculin test, and bacteriological examinations of the milk.

Covington. (Population, 42,938.)

[For comparison with other cities in Class III, see p. 34.]

Charles W. Reynolds, health officer.

The daily consumption of milk is estimated as 3,500 gallons, or 0.65 pint per capita. This is sold from 140 stores and 36 wagons. Two firms deliver milk in glass bottles, these being filled at the producing farms. The same firms pasteurize milk and the demand for milk so treated is increasing. Milk is retailed at 6 to 8 cents per quart throughout the year; the milk from one "model dairy" is sold regularly at 8 cents. There are no dairy herds within the city limits. Milk is sent in from 31 dairy farms, all within 9 miles of the city.

During the past year 372 samples of milk were examined by the lactometer and Babcock test; no bacteriological examinations were made; all the dairy farms were inspected.

Newport. (Population, 28,301.)

No reply to inquiries was received.

Lexington. (Population, 26,369.)

[For comparison with other cities in Class III, see p. 34.]

F. O. Young, M. D., president of the board of health.

The daily consumption of milk is estimated as 2,000 gallons, or 0.61 pint per capita, besides 258 gallons of skimmed milk and 178 gallons of cream. Milk is sold from 10 stores and 48 wagons. Ninety per cent of the milk is delivered in glass bottles filled at the farms. About one-third of the supply is pasteurized, and this practice is increasing. The retail price of milk is 5 cents per quart in summer and 6¼ cents in winter, producers receiving 3⅛ cents and 3¾ cents, respectively. Milk is brought to the city in wagons from 39 dairy farms, the longest haul being 7 miles.

The city has no milk ordinance and exercises no supervision over its milk supply.

LOUISIANA.

Acts of 1882, No. 82, refers to foods. It forbids the sale of adulterated food, which term is defined at length. It is the duty of the State board of health to investigate foods.

New Orleans. (Population, 287,104.)

[For comparison with other cities in Class I, see p. 26.]

Quitman Kohnke, M. D., health officer.

The daily consumption of milk is estimated as 9,609 gallons, or 0.27 pint per capita, besides 200 gallons of skimmed milk and 75 gallons of cream. Milk is distributed from 17 stores and 410 wagons. A few venders use glass bottles in their trade. A small amount of milk is pasteurized, and this treatment is increasing in favor. The retail price of milk is 7½ cents per quart both in summer and winter, producers receiving 2¾ cents. There are 3 "model dairies" in the vicinity which sell their product for 10 cents per quart during the entire year. There are 440 dairy herds, including 6,686 cows, within the city limits, producing 86 per cent of the total supply, and 69 dairy farms send milk into the city, the longest shipment being 83 miles.

Several city ordinances relate to the milk supply. The principal one appears to be No. 16204, adopted in May, 1890; others are 4627 of 1890, 6596 of 1892, and 7581 of 1893. It is required that a permit be obtained for the production or sale of milk or other dairy product to be used as food in the city. This is issued by the board of health, free of charge, and only after certain detailed information regarding the source of the milk and the conduct of the proposed business has been filed; it is revocable for cause. Permit number and name of supplying dairy, etc., must appear on delivery wagons. The requirements for dairy stables and milk rooms are given in considerable detail, some of them being that all dairy buildings must be constructed in a sanitary manner, properly equipped, and well cared for; 600 cubic feet of air space must be allowed for each animal; milk appliances must be of nonabsorbent material; milk cans must be removed from the stable promptly when filled and be thoroughly scalded when cleaned; refrigerators must be constructed and located in a particular manner; milk must not be stored in a room where animals are kept; bottles must not be delivered to nor taken from any place where there is a contagious disease; bottles must not be filled on delivery wagons; stock must not be given impure water, nor fed on brewery grain or other unhealthy food; cows must be rejected if diseased and the tuberculin test must be used in their examination; healthy cows must be tagged; employees must be personally cleanly and healthy and not recently exposed to disease. The milk standard is 13 per cent solids, 9½ per cent solids not fat, 3½ per cent fat; specific gravity, at 60° F., 1.029. Adulterated milk, milk to which any foreign substance has been added, or milk from unhealthy cows is prohibited. Skimmed milk may be sold if in plainly labeled vessels. No liquid other than milk or cream shall be carried in a milk wagon.

The supervision of the milk supply is included in the work of the food inspection department and its expense to the city is not kept separately. In the department named there is one chief (a veterinarian), whose salary is $1,500, and 13 assistants paid $600 each. These officers inspect dairies and collect milk samples for the chemist, whose salary is $1,300. During the past year 1,141 samples of milk were examined by the Babcock test, pycnometer, or gravimetrically; 2 bacteriological examinations were made for tubercle bacilli; all the dairy herds within the city and 27 of the 69 dairy farms were inspected.

Milk "runs" are made at frequent irregular intervals. The officer is supplied with a known number of bottles with perforated necks and the same number of perforated lead seals, also short wires and a clamp. Samples must be sealed in the presence of the vender. The number of lead seals used and unused are checks on each other. The lead seals may be marked by venders if desired. (This method is explained here in detail because it differs from the one usually practiced by which samples are taken in duplicate, one being left with the vender for analysis or disposition as he chooses.)

It is said the average quality of the milk sold in the city has recently shown marked improvement.

MAINE.

Revised Statutes of 1883, chapter 38, sections 44 to 47, amended in 1887, 1893, and 1897, and Public Laws of 1895, chapter 144, section 1, refer to milk. Milk inspectors shall be appointed in towns of more than 3,000 inhabitants, and may be appointed in smaller towns. They are required to keep a record of the names and addresses of all milk dealers, and may inspect places and vehicles where milk is sold and take samples for analysis. It is unlawful knowingly to sell milk from cows having tuberculosis or other disease or fed upon the refuse of breweries or distilleries or other deleterious substance, or milk to which water or any foreign substance has been added. The milk standard is 12 per cent solids, 3 per cent fat. Skimmed milk must not be sold for pure milk. Milk must be sold by wine measure, and measures must be sealed annually.

Public Laws of 1895—chapter 169 requires that milk tests, for basis of payments, shall be accurate.

Portland. (Population, 50,145.)

[For comparison with other cities in Class II, see p. 30.]

W. C. G. Carney, health inspector.

The daily consumption of milk is estimated as 3,000 gallons, or 0.48 pint per capita. Milk is sold from 200 stores and 75 wagons. About one-fourth of the milk is delivered in glass bottles which are filled in the city. Little or no milk is pasteurized. The retail price of milk is 6 cents per quart in summer and 7 cents in winter, producers receiving 3 cents in summer and 4 cents in winter. A few dairies near the city, better conducted than others, receive a slight increase in price for their product. Within the city limits there are 19 herds of milch cows, including 134 head, and milk is sent into the city from 40 dairy farms. About three-fourths of the total milk supply is received by railway, the longest shipment being 48 miles.

The city has no milk ordinance and expends nothing in the supervision of its milk supply, therefore no inspection work has been done.

Lewiston. (Population, 23,761.)

[For comparison with other cities in Class IV, see p. 40.]

James H. Goddard, milk inspector.

The daily consumption of milk is estimated as 1,800 gallons, or 0.61 pint per capita. Milk is sold from 10 stores and 75 wagons. Glass bottles, used only to a small extent, are filled at the farms. About 500 gallons are pasteurized daily; the practice is not increasing. The retail price is 6 cents per quart throughout the year, the producers receiving 3 cents. There are no "model dairies" near the city. Within the city limits there are 25 herds, and milk is sent in from 50 dairy farms within a radius of 5 miles.

State statutes regulate the sale of milk.

About $200 is expended annually in the supervision of the milk supply, one official giving a part of his time to this work. During the past year about 300 milk samples were examined by gravimetric analysis; no bacteriological examinations were made; 15 city herds and 10 of the 50 dairy farms were inspected.

Waterville. (Population, 9,477.)

[For comparison with other cities in Class IV, see p. 40.]

A. Joly, D. V. S., milk inspector.

The daily consumption of milk is estimated as 800 gallons, or 0.68 pint per capita, besides 100 gallons of skimmed milk and 50 gallons of cream. Milk is sold from 15 stores and 39 wagons, and a number of private families sell milk to their neighbors. About 75 per cent of the supply is delivered in glass bottles filled at the farms; none is pasteurized. The retail price is 5 cents per quart in summer and 6 cents in winter. There are four dairies conducted on a considerably better plan than others, but they receive no advance in price for their product. Within the city limits there are 8 herds, including 75 cows, and milk is brought in wagons from 39 dairy farms, the longest haul being 8 miles.

State laws regulate the sale of milk.

One hundred dollars is expended annually in the supervision of the milk supply, one official giving a part of his time to this work. During the past year 160 samples of milk were examined by the lactometer and Babcock test; no bacteriological examinations were made; all the city herds and all the dairy farms were inspected.

The milk inspector's report for 1899 shows that out of 201 samples examined 7 were found to be below the standard, and these were from grocery stores where the milk was not mixed before sales. Thirty-four dairies were inspected, the inspection consisting of a physical examination of each cow and an examination of the water supply, drainage, ventilation, etc. Two herds were tested with tuberculin and found to be free from tuberculosis.

Recent improvement in the milk supply is due to better barns, cows, and sanitary conditions.

Belfast. (Population 4,615.)

[For comparison with other cities in Class IV, see p. 40.]

W. L. West, M. D., milk inspector.

The daily consumption of milk is estimated as 300 gallons, or 0.52 pint per capita, besides 20 gallons of skimmed milk and 5 gallons of cream. Milk is sold from 6 stores and 12 wagons. About one-half of it is delivered in glass bottles, filled at the farms, and the portion thus served is increasing. No milk is pasteurized except by consumers after delivery. The retail price is 5 cents per quart in summer and 6 cents in winter. There are no "model dairies" near the city. Within the city limits there are 5 herds, including 125 cows, and milk is brought in wagons from 30 dairy farms, the longest haul being 8 miles.

About $50 is expended by the city in the supervision of its milk supply, one official giving a part of his time to this work. During the past year 150 samples of milk were examined by lactometer, Babcock test, and gravimetric analysis; no bacteriological examinations were made; each dairy farm was inspected every month.

Recent improvement is shown in the feeding of cows and the handling of milk. Needed improvements, as given, include the testing of all cows with tuberculin; compelling milk to be delivered in glass bottles, and the dissemination of information regarding the care and handling of milk.

MARYLAND.

Laws of 1894—chapter 53 refers to milk. The mayor and city council of Baltimore shall make regulations for the sale and provide by ordinance for the inspection of milk and food products; shall provide for and fix compensation of inspectors and analysts.

Laws of 1898—chapter 306 refers to cattle and dairies. Cows producing market milk shall be registered with the live stock sanitary board, and a certificate of health may be furnished for a herd which is kept as the law requires and has no visible sign of disease. Said board must inspect at least annually premises where cows are kept and enforce rules requiring buildings to be sanitary, well lighted and ventilated, clean, and painted or whitewashed; cows to be clean, properly fed, and watered; milk vessels to be clean, etc.

Laws of 1890—chapter 604, sections 52 to 56, refer to milk and food. Diseased or unwholesome milk must not be sold. The State board of health is given power to enforce.

Laws of 1900—supplement, article 27, page 40, refers to milk and food. The milk standard is 12.5 per cent total solids, 3.5 per cent fat. The sale of adulterated milk, milk to which any foreign substance has been added, milk from diseased cows, and milk from cows fifteen days before or five days after parturition. Skimmed milk may be sold if properly labeled. Condensed milk must be from pure milk of standard quality.

Baltimore. (Population, 508,957.)

[For comparison with other cities in Class I, see p. 26.]

G. W. Lehmann, chemist of health department.

Estimated average amount of milk used daily is 25,000 gallons, or 0.39 pint per capita; skimmed milk, 5,000 gallons; cream, 4,000 gallons. Milk is distributed from 2,530 stores and 525 wagons. In its delivery glass jars are used by about twenty different concerns, only one of which brings the milk in them from the country. Pasteurized milk is used very little and is not increasing in favor. The retail price of milk is 5 to 10 cents per quart, the producers on the farms being paid 3 to 4 cents. There are three "model dairies" near the city and their milk is sold at 8 to 10 cents per quart. Within the city limits there are 3,314 cows in 539 stables and sheds. About 1,500 dairy farms send milk into the city, some of them from a distance of 200 miles.

Ordinance No. 87, 1894, applies to milk and other food products. It requires that milk sold shall be the natural product of healthy cows, from which no cream has been removed and to which no liquid, solid, or preservative has been added; it shall contain 3 per cent fat and 12 per cent total solids, and at 60° F. have a specific gravity of at least 1.029. Skimmed milk or buttermilk may be sold if purchaser is advised of its character. The board of health enforces the ordinance and is authorized to make additional rules. Ordinance No. 130, 1894, provides for prompt confiscation of milk for violation.

The city expends annually about $2,300 in the supervision of the milk supply. Two inspectors give their entire time and one chemist part of his time to this work. The year's work in 1900 included the examination of 31,803 lots of milk, aggregating 1,166,866 gallons, of which 11,226 gallons were spilled because shown by the lactometer or general appearance to be below the legal standard. The loss of his milk is practically the only penalty suffered by the offender; no arrests are made, on account of difficulty of prosecution before police justices. During the year 900 milk samples were examined for fat content by the centrifugal test and in a few cases by gravimetric analysis. The average of the analyses of 48 miscellaneous samples of milk taken during the twelve months, and which were considered good, showed total solids 13.96 per cent; fat, 4.58 per cent. It is suggested that some dealers use preservatives and some skillfully alter their milk with the aid of the lactometer, taking care not to bring it below the required standard. About 300 samples of milk have been examined microscopically or bacteriologically for tubercle bacilli, pus cells, etc. An interesting study was made along this line: Milk from 11 dairy farms, after its arrival in the city, was found to contain from 5,160 to 383,200 bacteria per cubic centimeter, 0 to 1.4 pus cells, and no tubercle bacilli. The clarifying of milk by means of a separator was not found to reduce its bacterial content. The milk of 11 unsanitary dairies near the city limits was found in all cases to have pus cells, varying in number from 0.1 to 9.5 per cubic centimeter, and tubercle bacilli were found in the milk of 3 of these dairies. Stables within the city limits and the sanitary condition of the stock are frequently inspected by a veterinarian. In one recent year the city inspector of cow stables issued over 1,100 notices to abate nuisances. Two hundred and twenty of the 1,500 dairy farms sending milk into the city have been inspected under the direction of the State live-stock sanitary board.

The form to be attached to a can from which milk has been spilled is shown in Appendix IV (p. 206).

There has recently been noticeable improvement in the quality of milk and the cleanliness of dairy stables, and increased care has been taken to exclude diseased animals from dairy herds. Suggested improvements include a standard of 13 per cent total solids and 4 per cent fat, and more milk inspectors and legislation to compel all milk shippers to submit to the regulations of the local health department.

MASSACHUSETTS.

George M. Whitaker, agent of State dairy bureau, Boston.

Acts of 1901, chapters 202 and 360; 1900, chapters 300, 359, 368, and 369; and 1891, chapter 412, sections 7 to 11, provide for the protection of dairymen, sealing of glass bottles and measures, enforcement of State dairy laws by the dairy bureau, and refer to adulteration of milk and destruction of milk vessels. Public Statutes, chapter 57, sections 1 to 11, amended; and acts of 1899, chapter 169, section 1; 1896, chapter 264, sections 1 and 2; 1894, chapter 425, section 1; 1889, chapter 326, section 1; 1886, chapter 318, sections 3 and 4, amended; and 1885, chapter 352, section 8, refer to milk, milk inspectors, etc.

The dairy bureau is empowered to investigate all dairy products. The mayor and aldermen of cities shall, and the selectmen of towns may, appoint milk inspectors. (Under authority of other acts the milk inspectors of Boston, Lynn, and Somerville are appointed by the boards of health of those cities.) Persons peddling milk in cities or towns having milk inspectors must be licensed annually in May; fee, 50 cents. License number and place of business must be shown on wagons, etc., and all changes of employees must be reported. Persons selling milk from stores, etc., must be registered; fee, 50 cents. Dealers in milk or cream may register in the office of the clerk of the city or town brands for bottles, cans, etc., including the word "registered," and cause the same to be published, and the use or destruction of such vessels or mutilation or destruction of marks thereon by other parties than the owner is prohibited, and it is unlawful to put into such vessels any unclean or foul substance or matter. Inspectors may visit places where milk is sold and take samples for analysis. Duplicate samples must be given to owners when requested and report of analysis must be sent to them within ten days. It is unlawful to sell milk not of good standard quality, or adulterated milk, or milk to which water or any foreign substance has been added, or milk from cows diseased or fed upon the refuse of distilleries; and it is unlawful knowingly to feed garbage to a milch cow. The milk standard, October to March, is 9.3 per cent solids not fat, 3.7 per cent fat; April to September, 9 per cent solids not fat, 3 per cent fat. Skimmed milk must be plainly marked; its standard is 9.3 per cent solids not fat. Cans, bottles, etc., of specified capacities used for distribution of milk or cream shall be sealed as measures. Glassware, etc., used in tests shall be tested for accuracy and marked by the director of the Hatch experiment station, and once each year he shall test centrifugal machines used in such tests. Milk tests must be accurate, and persons manipulating them shall hold a certificate of competency from said director. Said director shall test by the Babcock method samples of milk or cream for farmers, creameries, factories, or milk depots, the charge being for actual cost. Convictions for selling adulterated milk must be advertised in newspapers. Condensed milk must be labeled with the name of manufacturer; if in hermetically sealed packages, brand and contents must also be shown.

The State board of health does more than the dairy bureau in the supervision of the milk supply of cities. Very few sanitary inspections are made. The dairy bureau has no jurisdiction over local milk inspectors, but has broader power and to a limited extent cooperates with them. In most cities the chief work of the milk inspector consists of issuing licenses and keeping a record of certain statistical and other general information. In many cases their compensation is merely nominal.

In several cities and towns the State laws relating to the milk supply are published and distributed by local authorities.

Boston.[a] (Population, 560,892.)

[For comparison with other cities in Class I, see p. 26.]

Charles Harrington, M. D., inspector of milk.

Alexandre Burr, health department.

The daily receipts of milk are estimated at 82,250 gallons, or 1.17 pints per capita. In explanation of this apparently large per capita consumption, the inspector of milk states that a very large amount of milk is consumed each day at the quick-lunch places and elsewhere by the several thousand persons who live in neighboring cities and towns but spend the business hours in Boston. A single lunch room uses as high as 640 quarts daily. The milk supply is practically controlled by a few large contractors, who operate cars on the different railroads. The contractors will not sell skimmed milk. It is impracticable to estimate the amount of cream used, as a considerable part of it is shipped by express to retailers. Milk is sold in about 2,900 stores; the number of wagons employed in its delivery is not known. Licenses for the sale, etc., of milk have been issued to the number of 506. Some licensees do not operate wagons, while others may run as many as 30. It appears that milk stores from which the milk is not peddled are not required to have a license, but simply a permit. Glass bottles filled in the city are quite extensively used for delivering milk; they are used but little in its transportation. Very little pasteurized milk is on the market, and it is not increasing in favor. The retail price of milk is from 5 to 8 cents per quart (32 fluid ounces) in summer and winter, and the producers are paid about 3 cents per quart in summer and 4 cents in winter. There are about 20 well-conducted dairies in the vicinity of Boston, but, with one or two exceptions, they receive no advance in price for their product. Within the city limits there are 126 dairy herds, including 739 head. The number of dairies sending milk into the city is not known; 75 per cent of the milk supply is received by railway, the longest shipment being 140 miles.

The regulations for the sale and care of milk adopted in December, 1898, are published in circular No. 8 of the board of health. Five sections of regulations adopted in 1892 appear to be also in force. Persons selling milk must obtain a license from the board of health annually, in May; it is revocable for cause. A statement of the conditions under which each cow is kept must be filed with the inspector of milk. No milk shall be sold from cows that have not, within one year, been examined and found to be free from dangerous disease. The tuberculin test is not required. License must be posted in a conspicuous place on premises, and wagons must bear owner's name and license number. All cans and vessels used in handling milk must be cleaned or sterilized before use, nor shall they be used for any other purpose. Rooms in which milk is stored, cooled, or mixed must have tight walls and floors and be kept clean, and must have proper appliances for washing or sterilizing all dairy utensils with boiling water or steam. Such room must not be connected with water-closet, urinal, etc., nor be used for stabling animals, nor shall milk be stored in a room used for domestic or sleeping purposes. Milk in stores, restaurants, etc., must be kept in a covered box or refrigerator properly drained and cared for.

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[a] The milk supply of Boston is discussed at length in Bulletin No. 20, Bureau of Animal Industry.

Every person engaged in handling milk must notify the board of health and stop the sale of milk when an infectious disease is discovered in his family or among his employees. All vessels handled by persons suffering from such diseases shall be thoroughly sterilized before being used to hold milk. Cow stables must have at least 1,000 cubic feet air space for each animal, be well lighted and ventilated, have tight roof and floors, be well drained, have a pure water supply, and be kept clean. Pastures must be clean.

A copy of the instructions sent out by an enterprising Boston milk contractor to the dairymen from whom his milk is obtained is shown in Appendix II (p. 181).

About $13,000 is expended annually in the supervision of the city milk supply. An inspector, a chemist, a clerk, and three collectors of samples give their entire time to this work. During the past year about 15,000 samples of milk were examined by lactometer and lactoscope, the Babcock test, and gravimetric analysis, all of them being tested for preservatives; no bacteriological examinations were made; all of the city herds, and "many hundreds" of the dairy farms sending milk into the city, were inspected. A detailed description of the method of procuring samples of milk for inspection is given on page 22.

The form for application to sell milk is shown in Appendix IV (p. 195).

The form for reporting conditions at dairies is shown in Appendix IV (p. 196).

The form for license to sell milk, receipt, and stub for same, are shown in Appendix IV (p. 202).

Recent marked improvement has been made in the sanitary quality of the milk supply. Suggested improvements include the education of those who use milk, as well as those who produce it. The consumer wants his milk delivered early in the morning and insists that it must be fresh. He will not deal with one who would propose to deliver as late as 10 o'clock a. m., which is about the time the milk trains arrive. So the dealer is obliged to hold the milk, perhaps in his stable, through the day and over one night, in order that it may be delivered early in the morning.

Worcester. (Population, 118,421.)

[For comparison with other cities in Class I, see p. 26.]

C. Herbert De Fosse, inspector of milk.

The milk inspector's records show that there are received in the city daily about 16,500 gallons milk, 200 gallons skimmed milk, 250 gallons cream, and 400 cans of condensed milk. It would appear from these figures that the average consumption of milk is 1.1 pints per capita. But it is somewhat less than this, for the reason that considerable milk, cream, etc., is sent from Worcester to smaller towns within a radius of 30 to 40 miles. However, it is claimed that an unusually large amount of milk is consumed in the city, much of it being employed in cooking; bread made with milk is used to a large extent. It is estimated that the residents of the city pay annually for milk $1,095,000. Milk is distributed from 400 stores and 350 wagons. About 85 per cent of the supply is delivered in glass bottles, and these are filled at the farms. Only about one two-hundredth part of the milk is pasteurized, and this treatment does not seem to be increasing in favor. The retail price of milk is 5½ cents per quart, both summer and winter, its producers receiving 3¾ cents per quart throughout the year. Twenty-five of the dairies which are conducted in the most satisfactory manner sell their product at 7 cents per quart in summer and 8 cents in winter. Within the city limits there are 340 dairy herds, including 4,036 head. Five hundred and sixty-eight dairy farms send milk into the city; about 1 per cent is received by railway, the longest shipment being 25 miles.

The city authorities appropriate $1,000 annually for the supervision of the milk supply. Three officers give a part of their time each day to this work. During the past year 1,400 samples of milk were examined, 200 general bacteriological examinations were made, and 316 dairy herds within the city limits were inspected.

The form for recording data regarding milk samples is shown in Appendix IV (p. 204.)

The form for reporting analyses of milk samples is shown in Appendix IV (p. 206).

Previous to April, 1899, little was done to govern the supply of milk in this city. Since that date facilities for examining milk samples have been provided by the equipment of a new laboratory.

The recent introduction of a large number of cows giving rich milk has caused a marked improvement in the quality of the supply. An ordinance is needed to regulate the sanitary condition of places where milk is kept.

Fall River. (Population, 104,863.)

[For comparison with other cities in Class I, see p. 26.]

Thomas F. Wiseman, secretary of the board of health.

The daily consumption of milk is estimated at 6,000 gallons, or about 0.46 pint per capita. The estimated quantities of skimmed milk and cream used daily are 4 and 50 gallons, respectively. Milk is distributed from 327 stores and 320 wagons. About 10 per cent of the milk is delivered in glass bottles, and the portion thus handled is increasing. The bottles are filled almost exclusively at the farms. Little, if any, milk is pasteurized. The retail price of milk is 5 to 6 cents per quart in summer and 6 to 7 cents in winter. The producers on the farms realize 3½ to 4½ cents per quart in summer and 4 to 5½ cents in winter. The product of five well-conducted dairies is sold for 7 cents per quart throughout the year. Within the city limits there are 105 herds of milch cows, including 350 head. Two hundred and forty dairy farms send milk into the city. All these are within a radius of 10 miles, and the milk is brought in by teams.

An ordinance adopted June, 1899, and milk regulation No. 71 refer to the milk supply. A license to sell milk in a store or from a wagon must be obtained from the board of health, and all dairy premises, vessels, and vehicles must be kept in a sanitary condition satisfactory to said board. License must be posted in stores and carried in delivery wagons, and wagons must bear owner's name and wagon and license numbers. Milk adulterated by watering, skimming, or by the addition of any foreign substance, milk from diseased cows or cows fed on distillery waste or other fermented food, milk from cows within fifteen days before or five days after calving, or milk from cows kept in a crowded or unhealthy condition is prohibited, and may be seized and destroyed. The milk standard is 12 per cent solids, 3 per cent fat. Persons selling skimmed milk must obtain a special license from the board of health, and delivery wagons and vessels must be plainly marked "Skimmed milk," etc. Milk shall not be kept, nor bottles washed, in any room used for sleeping or any domestic purposes or in a room opening into the same, nor shall milk be stored in a stable, and a room separate from the stable and water-closet shall be provided on dairy farms for straining and cooling milk, the same to have tight floors and walls. Cows must be examined at least once a year for tuberculosis and other contagious diseases in a manner approved by the board of health. All dairies shall be inspected at least every June and December, and written report of their condition filed with the city clerk for public examination. Walls of cow stables must be cleaned and whitewashed at least once every six months. Milk in stores must be kept in a refrigerator or other tight receptacle separate from any food or contaminating product, and iced in warm weather. Milk in wagons shall be protected from dust, and on the streets it shall never be transferred from one vessel to another except when delivered to the consumer. Milk shall not be sold in bottles unless they are first washed with hot water cleaning solution and then with clean hot water; they must not be filled except at the dairy or creamery, or in a room free from dust. Vessels handled by persons suffering from a contagious disease must be sterilized before being used to hold milk. No attendant suffering from or suspected of a contagious disease is allowed to care for cows or handle milk. Every person engaged in handling milk must notify the board of health and stop the sale of milk when an infectious disease is discovered in his family or among his employees.

The section referring to skimmed milk is shown in Appendix I (p. 179).

About $1,250 is expended annually in the supervision of the milk supply. One milk inspector gives his entire time to this work. During the year 257 samples were examined by the Babcock test, 7 being found below standard; no bacteriological examinations were made. All the dairies within the city and all of the dairies and farms sending milk to the city were inspected.

Since the appointment of a milk inspector there has been much improvement in the sanitary condition of dairies, milk utensils, etc. It is believed that to a certain extent the production of market milk should be under State authority. Frequent bacteriological examinations of the milk supply should be made.

The form for recording inspection of stores, etc., is shown in Appendix IV (p. 207).

The form for recording inspection of wagons, etc., is shown in Appendix IV (p. 208).

Lowell. (Population, 94,969.)

[For comparison with other cities in Class II, see p. 30.]

Thomas O. Allen, inspector of milk and vinegar.

The daily consumption of milk is estimated as 7,700 gallons, or 0.65 pint per capita, besides 200 gallons of skimmed milk and 50 gallons of cream. Milk is sold from about 350 stores and 156 wagons. Glass bottles are used in the delivery of about one-fourth of the total supply, and are filled both in the city and at the dairy farms. Only about 3 per cent of the milk is pasteurized, and there is no increase in the practice. The retail price of milk is 5 cents per quart in summer and 6 cents in winter, the producers receiving 2.7 cents in summer and 3 cents in winter. The product of one "model dairy" near the city is sold for 7 cents per quart throughout the year. There are only about 100 cows within the city limits, and no data are available as to the number of dairy farms sending milk into the city. About 300 gallons is shipped into the city by railway, the longest shipment being 20 miles.

State laws regulate the milk supply.

The supervision of the milk and vinegar cost the city last year $2,329.97. Two officials—one inspector, who is also city analyst, and one collector of samples—give their entire time to this work. During the past year 2,972 samples of milk were examined by the Babcock test and by gravimetric analysis; only a few bacteriological examinations were made.

The averages of total solids in samples of milk collected from wagons and stores, in different months of the year, are as follows:

	From wagons.	From stores.		From wagons.	From stores.
	Per cent.	*Per cent.*		*Per cent.*	*Per cent.*
January	12.80	12.16	July	12.70	11.50
February	12.92	12.41	August	12.72	12.06
March	13.16	12.98	September	13.00	12.83
April	13.11	13.21	October	13.07	12.47
May	12.82	13.20	November	13.08	11.94
June	12.92	12.05	December	13.00	12.77

It is stated that a law is needed to regulate the sanitary condition of dairy barns, lots, pastures, etc., and that it would be well to have a standard of cleanliness for dairies, those not coming up to it to be excluded from the privilege of selling milk in the city.

Cambridge. (Population, 91,886.)

[For comparison with other cities in Class II, see p. 30.]

Philip P. Sharples, inspector of milk.

The daily consumption of milk is estimated as 9,074 gallons, or 0.79 pint per capita. In addition to what is used by ice-cream manufacturers and bakers, 202 gallons of skimmed milk and 116 gallons of cream are used in family trade. There are sold, daily, 4,324 gallons of milk from 410 stores, 4,639 gallons by 156 milkmen, and 111 gallons from "private cows." Three-fourths of the milk used in family trade is delivered in glass bottles, the greater part of them being filled in the city. Little or no milk is pasteurized; one concern tried it, but is now out of business. The retail price of milk is 4 to 8 cents per quart in summer and 5 to 9 cents in winter, the producers receiving 3¼ cents in summer and 3½ cents in winter. The milk of a few well-conducted dairies near the city is sold for 8 cents per quart in summer and 9 cents in winter. Within the city limits there are 76 herds of milch cows, including 234 head. Five hundred or more dairy farms send milk into the city. The city herds produce, daily, 476 gallons of milk; wagons haul to the city 3,770 gallons, and railway trains bring 4,828 gallons. The longest shipment is 100 miles.

The city has no milk ordinance, the milk supply being regulated by State laws.

One thousand five hundred dollars is expended annually in the supervision of the milk supply. Two officials—an inspector and his deputy—give one-half of their time to this work. During the past year 3,367 samples of milk were examined by the Babcock test; suspected samples were tested for coloring and preservatives, and all the city herds were inspected.

The form used when applying for milk license is shown in Appendix IV (p. 188).

Recent improvement in the quality of the milk supply is said to be due to the fact that it is now largely in the control of concerns that pay strict attention to the character of the milk they handle. It is recommended that the license fee for stores be raised to $50.

Lynn. (Population, 68,513.)

[For comparison with other cities in Class II, see p. 30.

William E. Welts, inspector of milk.

The daily consumption of milk is estimated as 6,000 gallons, or 0.70 pint per capita, besides 600 gallons of skimmed milk and 125 gallons of cream. Milk is sold from 350 stores and 75 wagons. Glass bottles are used to a limited extent in the delivery of milk, these being filled both in the city and at the producing farms. Only a very small quantity of milk is pasteurized and the practice is decreasing. The retail price of milk is 4 to 7 cents per quart, both summer and winter, the producers receiving 2 to 3½ cents per quart throughout the year. A few especially well-conducted dairies near the city sell their product for 7 cents per quart the year round. Within the city limits there are 60 herds, including 350 cows, and milk is sent into the city from about 800 dairy farms. Two-thirds of the entire milk supply is shipped by railway, the longest shipment being about 300 miles.

Regulations adopted in April, 1899, supplement the State laws referring to the milk supply. Cows which produce milk for the city must have been examined (within one year) and found free from dangerous disease. Rooms where milk is handled must be properly constructed and located; all dairy utensils must be kept clean and, when exposed where contagious disease exists, must be thoroughly sterilized. Milk from places where there is any contagious disease is prohibited.

The city expends $2,500 annually in the supervision of its milk supply. Two officials—an inspector and a collector of samples—give their entire time to this work. The number of milk samples examined during the past year is not reported; all the herds in the city and all the dairy farms within the State sending milk to the city have been inspected.

Recently the quality of the milk supply has improved, due to the enforcement of the milk regulations. It is recommended that tuberculin tests be made of cows outside the State producing milk for the city.

Lawrence. (Population, 62,559.)

[For comparison with other cities in Class II, see p. 30.]

Michael A. Scanlon, inspector of milk.

The daily consumption of milk is estimated as 6,000 gallons, or 0.76 pint per capita, besides 500 gallons of skimmed milk and 200 gallons of cream. Milk is sold from 700 stores and 200 wagons. Glass bottles are used quite extensively in the delivery of milk. The increase in their use will be checked by the destruction of some bottles under an act of the State legislature requiring all bottles to be sealed by the sealer of weights and measures. The bottles are filled mostly at the producing farms. Little or no milk is pasteurized. The retail price of milk is about 6 cents per quart throughout the year. The producers realize 2½ to 3 cents per quart in summer and 3½ to 4 cents in winter. Within the city limits there are 8 dairy herds, including 130 cows. The longest shipment of milk from the country is 12 miles.

State laws regulate the city milk supply.

Only about $350 is expended annually in the supervision of the city milk supply. The inspector (salary $150 per year) gives one hour daily to this work, occasionally going out to collect samples. During the past year 179 samples were examined by the Babcock test, and all of the city herds were inspected. When milk samples are found by the Babcock test to be below the standard, they are submitted to chemical analysis, for which the city pays $2 per sample.

Recently a more even quality of milk has been supplied, owing to mixing the milk of numerous herds of cows, and its quality has improved because of more sanitary conditions at dairies. It is stated that the license fee should be raised from 50 cents to $25 or more, and closer attention should be given to producing dairies.

New Bedford. (Population, 62,442.)

[For comparison with other cities in Class II, see p. 30.]

Daniel C. Ashley, D. V. S., inspector of milk, provisions, and animals.

The daily consumption of milk is estimated as 7,000 gallons, or 0.90 pint per capita. Milk is sold from 201 stores and 170 wagons. A very small part of the milk is delivered in glass bottles, and these are filled at the producing farms. No milk is pasteurized. The retail price of milk is about 6 cents per quart throughout the year, producers receiving 3 to 3½ cents in summer and 3½ to 4 cents in winter. There are no "model dairies" near the city. Within the city limits there are 700 milch cows, kept 1 to 20 in a place. Milk is received from many of the adjacent towns. Only a small portion of the supply comes in by railway, the longest shipment being 20 miles.

State laws regulate the milk supply.

About $1,500 is expended annually for the inspection of milk, provisions, and animals. Two officials—an inspector and one assistant—give their entire time to this work. During the past year 900 samples of milk were examined by lactometer, lactoscope, etc.; no bacteriological examinations were made; all the city herds were inspected.

The inspector states that the most needed improvements are a more thorough inspection of milch cows with the aid of turberculin, and the enforcement of a requirement that dairy utensils be scalded after use.

Springfield. (Population, 62,059.)

[For comparison with other cities in Class II, see p. 30.]

James Kimball, inspector.

The daily consumption of milk is estimated as 4,750 gallons, or 0.61 pint per capita. Milk is sold from 103 stores and 133 wagons. About 1,000 quarts of milk is delivered in glass bottles, which are filled in the city. No milk is pasteurized. The retail price[a] of milk is 6 cents per quart, both summer and winter, except bottled milk, which sells for 7 cents per quart. The producers receive 3 cents per quart in summer and 3½ cents in winter. There are no "model dairies" in or near the city. Within the city limits there are 20 herds of milch cows, including 130 head, besides about 100 cows kept in private stalls, 1 or 2 in a place. Milk is sent into the city from 420 dairy farms. All the milk is brought in by teams, the longest haul being 14 miles.

A cooperative milk association controls a large part of the trade in Springfield. This association was organized in 1884. According to the fifteenth annual report (1899), the receipts of milk during that year were 2,911,218 quarts, which was 38,000 quarts less than the receipts of the previous year. There was paid to the farmers $68,751.29, which was $1,373.08 more than in the previous year. The report showed 150 patrons, 86 of whom were stockholders.

There is no city milk ordinance.

The city expends annually $100 in the supervision of its milk supply. During the past year a number of samples were examined by the lactometer and the Babcock test.

Recent improvement has been made in the milk supply, by an organized effort on the part of dealers requiring the producers to adopt better sanitary methods in handling milk. There is need for a thorough inspection of all premises where milk is handled.

Somerville. (Population, 61,643.)

[For comparison with other cities in Class II, see p. 30.]

J. E. Richardson, inspector of milk and vinegar.

The quantity of milk sold daily is reported as 7,640 gallons, or an average of 0.99 pint per capita, besides 400 gallons of skimmed milk and 500 gallons of cream. In explanation of the apparently large consumption of milk it is stated that a part of the milk reported is probably sold in adjacent towns. Milk is sold from 300 stores and 185 wagons. In addition to the above, there were 5 cream teams, 1 condensed milk, and 1 modified-milk team licensed. Glass bottles, filled in the city, are used in the delivery of about one-half of the milk supply. Only a limited amount of milk is pasteurized, with no increase in the practice. The retail price of milk is 6 cents per quart in summer and 7 cents in winter, the producers receiving 3 cents in summer and 4 cents in winter. There are no "model dairies" near the city. Within the the city limits there are 2 herds, including 62 milch cows, besides 222 cows kept 1 or

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[a] The retail prices established by the local milk dealers' association are as follows:

	Cents per quart.
Pasteurized and sterilized milk	8
Bottled milk	7
Can delivery, private families	6
Boarding houses, hotels, etc:	
Less than 5 quarts daily	6
From 5 to 10 quarts daily	5
Ten quarts or more daily	4½
Stores	4½

2 in a place. There is no record of the number of dairy farms sending milk into the city. Seven-eighths of the total supply is received by railway, the longest shipment being 175 miles.

The milk supply is regulated by State laws.

About $500 is expended annually in the supervision of milk, one inspector giving a part of his time to this work. During the past year 575 samples of milk were examined by the Babcock test and by gravimetric analysis; no bacteriological examinations were made; 19 milk cases were prosecuted.

Holyoke. (Population, 45,712.)

[For comparison with other cities in Class III, see p. 36.]

James K. Morrill, inspector of milk and vinegar.

The daily consumption of milk is estimated as 4,373 gallons, or 0.77 pint per capita; also 488 gallons of skimmed milk and 63 gallons of cream. Milk is sold from 172 stores and 136 wagons, and about 25 per cent is delivered in glass bottles, which are filled mostly at the farms. Very little milk is pasteurized, and the practice is not increasing. Milk is retailed at 5 cents per quart in summer and 6 cents in winter, the producer receiving 3¼ cents and 3¾ cents, respectively. The milk from a few specially well-conducted dairies near the city is sold for 7 cents per quart in summer and 8 cents in winter. Within the city limits there are 78 herds, including 858 cows, and milk is sent in from 2,750 cows on about 300 farms. Very little milk is received by railway, the longest shipment being 16 miles.

The city has no milk ordinance, but prints State laws referring to milk.

The city expends annually about $500 in the supervision of its milk supply, two officials giving nearly half their time to this work. During the past year 260 samples of milk were examined by the Babcock test; no bacteriological examinations were made; all the city herds were inspected, and there were 5 prosecutions for violations, and 14 warnings. The prosecutions were: One for selling skimmed milk from a can not properly marked, 1 for peddling milk without license, 3 for selling milk from stores without license.

The form for warning against the sale of adulterated milk is shown in Appendix IV (p. 209).

It is stated that there should be some limitation to sale of milk in markets, candy stores, etc., and that glass bottles should be more generally used.

Brockton. (Population, 40,063.)

[For comparison with other cities in Class III, see p. 36.]

Benjamin Thatcher, inspector of milk.

The daily consumption of milk is estimated as 3,200 gallons, or 0.64 pint per capita, besides 50 gallons of skimmed milk and 40 gallons of cream. Milk is sold from 150 stores and 150 wagons. About one-half the milk is supplied in glass bottles filled at the farms, and a large percentage of it is pasteurized. The retail price of milk is 6 cents per quart throughout the year. There is one "model dairy" near the city, but its product is not sold for an extra price. Within the city limits there are 41 herds, including 584 cows. Milk is supplied from 20 dairy farms, the most distant one being 16 miles. No milk is received by railway.

The city has no milk ordinance or regulation.

During the past year $100 was expended for milk-inspection work; 25 samples of milk were examined; all the city herds and all the dairy farms were inspected.

Haverhill. (Population, 37,175.)

[For comparison with other cities in Class III, see p. 36.]

Grantley W. Bickell, inspector of milk.

The daily consumption of milk is estimated as 3,290 gallons, or 0.71 pint per capita. Milk is sold from 120 stores and 100 wagons. Glass bottles, filled at the farms, are used very largely in the delivery of milk. No milk is pasteurized. The retail price is 6 cents per quart throughout the year, the producers receiving 3 cents and 3½ cents, respectively, in summer and winter. The milk from a few dairies conducted in a very satisfactory manner is sold at the regular price. Within the city limits there are 120 herds, including about 1,000 cows, and milk is sent in from 125 dairy farms, the most distant being 10 miles.

A city ordinance requires four dairy inspections per year.

The city expends annually about $150 in the supervision of its milk supply. No one official gives his entire time to the work. During the past year 275 samples of milk were examined by lactometer and Babcock test; no bacteriological examinations were made; all the city herds and 39 of the 125 dairy farms were inspected.

The form to accompany application for milk license is shown in Appendix IV (p. 191).

Improvement has recently been shown in the grade of cows, sanitary conditions of the buildings, and the care of utensils. The importance of having attendants free from disease is emphasized.

Salem. (Population, 35,956.)

[For comparison with other cities in Class III, see page 36.]

R. L. Newcomb, clerk of the board of health.

The daily consumption of milk is estimated as 4,200 gallons, or 0.93 pint per capita, besides 33 gallons of cream. Milk is sold from 80 stores and 61 licensed wagons. One-third of the total quantity delivered is supplied in glass bottles, filled either at the farms or in the city. About 20 gallons of milk is pasteurized daily, and is sold for 7 cents per quart. The demand for milk so treated is increasing. The retail price of milk is 6 to 7 cents per quart in summer and 6 to 8 cents in winter, producers receiving 3½ to 4 cents throughout the year. The milk from a few especially well-conducted dairies near the city is sold for 7 to 8 cents per quart. Within the city limits there are 6 herds, including about 185 cows, and milk is sent in from 20 dairy farms, the most distant being 12 miles.

State officials supervise the milk supply.

Chelsea. (Population, 34,072.)

[For comparison with other cities in Class III, see p. 36.]

George F. Marsh, inspector of milk.

The daily consumption of milk is estimated as 3,800 gallons, or 0.89 pint per capita, besides 100 gallons of skimmed milk and 40 gallons of cream. Milk is sold from 179 stores and 46 wagons. Glass bottles are used almost entirely for retail delivery, being filled in the city. Milk is pasteurized only for special orders, and the practice is not increasing. The retail price of milk is 4 to 7 cents per quart in summer, and 5 to 8 cents in winter. There are no "model dairies" near the city. Within the city limits there are 15 herds, including 140 cows. Ninety per cent of the milk is furnished by Boston contractors.

About $225 is expended by the city for milk-inspection work. During the past year 1,058 samples of milk were examined by the lactoscope; no bacteriological examinations were made; all the city herds were inspected.

An inspector is needed who is well equipped for the work and able to give it sufficient time.

Malden. (Population, 33.664.)

[For comparison with other cities in Class III, see p. 36.]

Henry M. Hartshorn, inspector of milk and vinegar.

The daily consumption of milk is estimated as 3,000 gallons, or 0.71 pint per capita, besides skimmed milk and cream in variable quantities. Milk is sold from 95 stores and 45 wagons. Only a few milkmen use glass bottles in the delivery of milk, and these are filled in the city. Little or no milk is pasteurized. The retail price of milk is 6 cents per quart in summer and 7 cents in winter, producers receiving 3½ and 4 cents, respectively. There are no "model dairies" near the city. Within the city limits there are 25 herds, including 183 cows. About half of the milk supply is received by railway, the longest shipment being 75 miles; this latter portion is believed to be of poorer quality than the milk produced near by.

The revised ordinances of 1894, chapter XXX, supplement the State laws in regard to milk. License fee for the sale of milk is 50 cents. Name and place of business of every person convicted of selling adulterated milk must be printed in two newspapers in the city or county, as well as in the report of the milk inspector.

The ordinance section regarding publication of names of violators is given in Appendix I (p. 180).

The city expends annually about $300 in the supervision of its milk supply, one official given a part of his time to this work. During the past year 475 samples of milk were analyzed gravimetrically; no bacteriological examinations were made; nearly all the city herds were inspected.

The examination of samples for milkmen and consumers is believed to have a beneficial and improving effect.

Newton. (Population, 33,587.)

[For comparison with other cities in Class III, see p. 36.]

Arthur Hudson, inspector of milk.

The daily consumption of milk is estimated as 5,275 gallons, or 1.25 pints per capita, besides 32 gallons of cream. Milk is sold from 140 stores and 130 wagons. Three-fourths of the milk is delivered in glass bottles, filled both in the city and at the farms. Very little milk is pasteurized, but the practice is increasing. The retail price of milk is 7 to 8 cents per quart throughout the year, producers receiving 3½ to 4 cents. The milk from one "model dairy" near the city is sold regularly for 8 cents per quart. Within the city limits there are 41 herds, of 7 or more animals each, including 1,170 cows, besides those kept by private families. Sixty-three dairy farms send milk into the city. Only 21 gallons of milk is received daily by railway, the longest shipment being 50 miles.

During the past year $601.39 was expended in the supervision of the city milk supply, one inspector giving about half of his time to this work. Samples to the number of 1,562 were examined by lactometer, doubtful samples by gravimetric analysis; bacteriological examinations were made for tubercle, typhoid, and lactis viscosis bacilli; all the city herds were inspected.

The form for notification that license to sell milk must be secured is shown in Appendix IV (p. 200).

There has been a recent improvement in the sanitary conditions at dairies and in the methods of handling milk. It is urged that printed instructions regarding the feeding of animals and the cooling and bottling of milk be distributed among milk producers.

Fitchburg. (Population, 31,531.)

[For comparison with other cities in Class III, see p. 36.

John F. Bresnahan, inspector of milk.

The daily consumption of milk is estimated as 4,541 gallons, or 1.15 pints per capita, besides 45 gallons of cream. Milk is sold from 99 stores and 126 wagons. Glass bottles, filled at the farms, are used quite extensively in the delivery of milk. No milk is pasteurized. The retail price is 6 cents per quart throughout the year, producers receiving 2⅗ cents in summer and 2⅘ cents in winter. The milk from a few well-conducted dairies near the city is sold at the regular price. Within the city limits there are 34 herds, including 404 cows, and milk is sent in from 1,152 cows on 58 dairy farms within 12 miles of the city.

Board of health regulations, May and June, 1897, supplement the State laws in regard to milk. A special license is required for the sale of skimmed milk. Milk bottles must be filled in properly constructed rooms and be thoroughly cleaned before using. Milk should be kept at a temperature below 50° F. In selling milk, the contents of a can should be mixed before measuring out the desired quantity. Cow stables must be properly constructed and located, and be kept clean. Cows must be groomed at least three times a week when kept in stables. Adulterated, etc., milk is prohibited, and may be seized and destroyed. The milk standard is 12 per cent solids, 3 per cent fat.

The city expends annually $300 (?) in the supervision of its milk supply as the salary of the milk inspector. During the past year 25 samples of milk were examined by the lactometer; 4 bacteriological examinations were made for bacilli of typhoid fever and diphtheria. All of the city herds but none of the dairy farms were inspected.

Taunton. (Population, 31,036.)

[For comparison with other cities in Class III, see p. 36.]

F. M. Scudder, inspector of milk.

The daily consumption of milk is estimated as 2,532 gallons, or 0.65 pint per capita. Milk is sold from 26 stores and 135 wagons. It is retailed at 6 cents per quart throughout the year. There are no "model dairies" near the city. Within the city limits there are 77 herds, including 810 cows. The most distant dairy farm supplying milk is 9 miles from the city. No milk is received by railway.

About $50 is expended annually by the city in the supervision of its milk supply, one inspector giving a part of his time to this work. During the past year 7 samples of milk were examined by the lactometer; no bacteriological examinations were made; all the city herds and nearly all of the dairy farms were inspected.

Gloucester. (Population, 26,121.)

[For comparison with other cities in Class III, see p. 36.]

Fred Corliss, inspector of animals, provisions, milk, and vinegar.

The daily consumption of milk is estimated as 2,300 gallons, or 0.70 pint per capita, besides 125 gallons of cream. No skimmed milk is sold. Milk is sold from 124 stores and 88 wagons. Glass bottles, filled at the farms, are used in the delivery of about 12 per cent of the milk supply. Very little milk is pasteurized and the practice is not increasing. Milk is retailed from stores at 6 cents per quart and from wagons at 7 cents throughout the year, the producer receiving 3½ cents. Within the city limits there are about 700 cows and 50 herds. The most distant dairy farm supplying milk is 16 miles from the city.

The city expends annually $150 in the supervision of its milk supply, the inspector giving a part of his time to this work. During the past year all of the city cows were inspected; no samples of milk were examined for composition.

North Adams. (Population, 24,200.)

[For comparison with other cities in Class IV, see p. 40.]

Albert G. Nichols, inspector of milk.

The daily consumption of milk is estimated as 2,000 gallons, or 0.66 pint per capita, besides 75 gallons of skimmed milk and 25 gallons of cream. Milk is sold from 10 stores and 50 wagons. About one-fourth of it is delivered in glass bottles filled at the farms; little or none is pasteurized. The retail price is 5 cents per quart in summer and 6 cents in winter, producers receiving 3 cents throughout the year. There are a few dairies conducted better than others, but they do not receive an advance in price for their product. Within the city limits there are 27 herds, including 377 cows, and milk is brought in wagons from 75 dairy farms, the longest haul being 9 miles.

An ordinance adopted in February, 1900, refers to milk. It requires that dairies, etc., be inspected in June and December, and premises and apparatus be kept clean; that cows be free from tuberculosis, and stables be whitewashed; that milk rooms be properly located and constructed; and that persons handling milk be free from contagious disease.

One hundred dollars is expended annually in the supervision of the milk supply, but this does not include a portion of the salary of the inspector of animals. During the past year about 300 samples of milk were examined by the Babcock test; no bacteriological examinations were made; all the city herds and all the dairy farms were inspected.

Recent improvement in the city milk supply is due to an increased use of bottles. Further improvement would result from the pasteurization of milk and the sterilization of utensils.

Woburn. (Population, 14,254.)

[For comparison with other cities in Class IV, see page 40.]

Gorden Parker, inspector of milk and vinegar.

The daily consumption of milk is estimated as 1,032 gallons, or an average of 0.58 pint per capita. Milk is sold from 16 stores and 30 wagons. Glass bottles are in general use in the delivery of milk and are filled in the city and at the farms. Little or no milk is pasteurized. The retail price is 6 cents per quart throughout the year, producers receiving 3⅛ cents and 3¾ cents in summer and winter, respectively. There are no "model dairies" near the city. The longest distance milk is supplied to the city is 5 miles.

One hundred dollars is expended annually in the supervision of the milk supply. During the past year 25 samples of milk were examined by lactometer and gravimetric analysis. Cattle are inspected by the local inspector of cattle and provisions under the direction of the State board of health.

Improvement of the milk supply might be brought about by frequent inspection of herds and barns, and by educating consumers as to what good milk is, so that they will demand it.

Melrose. (Population, 12,962.)

[For comparison with other cities in Class IV, see p. 40.]

William S. Briry, inspector of milk and vinegar.

The daily consumption of milk is estimated as 800 gallons, or 0.49 pint per capita, besides 25 gallons of skimmed milk and 20 gallons of cream. Milk is sold from 49 stores and 69 wagons. Nearly all milkmen deliver milk in glass bottles filled in the city. Some cream is pasteurized, and the practice is increasing. The retail price of milk is 5 to 7 cents per quart throughout the year, producers receiving 4 cents. Six dairies, better conducted than others, receive 7 cents per quart for their product. Within the city limits there are 40 herds, including 150 cows, and milk is sent in from 25 dairy farms. About 5 per cent is received by railway, the longest shipment being 10 miles.

The city prints State laws relating to the inspection and sale of milk.

One hundred dollars is expended annually in the supervision of the milk supply, one official giving a part of his time to this work. During the past year 36 samples of milk were examined by lactometer and gravimetric analysis; no bacteriological examinations were made.

Wakefield. (Population, 9,290.)

[For comparison with other cities in Class IV, see p. 40.]

Josiah S. Bonney, inspector of milk.

The daily consumption of milk is estimated as 800 gallons, or an average of 0.68 pint per capita. Milk is sold from 93 stores and 54 wagons. A large amount of milk is delivered in glass bottles filled at the farms; little if any is pasteurized. The retail price is 6 cents per quart throughout the year, producers receiving 3½ cents in summer and 4 cents in winter. A few well-conducted dairies receive 7 cents per quart for their product. Within the city limits there are 83 herds, including 343 cows. About 12 per cent of the milk is received by railway, the longest shipment being 35 miles.

There is allowed annually the sum of $150 as salaries of milk inspector and collector. During the past year 154 samples of milk were examined by the Babcock test and gravimetric analysis; no bacteriological examinations were made; all the city herds were inspected; $150 was collected as fines, and $40 as license fees.

The inspector believes that better sanitary conditions should obtain at dairies, and that all the milk should be pasteurized.

North Attleboro. (Population, 7,253.)

[For comparison with other cities in Class IV, see p. 40.].

W. Henry Kling, inspector of milk, provisions, and cattle.

The daily consumption of milk is estimated as 885 gallons, or 0.98 pint per capita. Milk is sold from 6 stores and 34 wagons. Four dealers deliver milk in glass bottles filled at the farms. No milk is pasteurized. The retail price is 6 cents per quart throughout the year, producers receiving 3 to 3½ cents in summer and 4 cents in winter. There are no "model dairies" near the city. Within the city limits there are 24 herds, including 275 cows, and milk is brought in wagons from 8 dairy farms, the longest haul being 4 miles.

About $200 is expended annually in the supervision of the milk supply, one official giving a part of his time to this work. During the past year 150 samples of milk were examined by the Babcock test; no bacteriological examinations were made; 535 cows were inspected, and 3 condemned for tuberculosis.

A copy of the form used for placing a cow or cows in quarantine when suspected of having tuberculosis is shown in Appendix IV (p. 199).

Recent improvement in the milk supply is due to cleaner barns and cows and to more care in handling milk. It is recommended that employees wear special clothes while milking; that milk be removed from the stable immediately after milking; that cows be fed pure feeds and curried daily, and that udders be washed before milking.

MICHIGAN.

W. B. Snow, dairy and food commissioner, Lansing.

Public acts of 1893—No. 211, amended, provides that the dairy and food commissioner shall inquire into the quality of dairy products sold in the State, and gives him authority to take samples for analysis. Prosecuting attorneys shall assist in enforcing the food laws. Monthly bulletins shall be issued showing results of inspections.

Public acts of 1887, No. 246, amended; 1899, No. 106, and 1873, No. 26, refer to milk and milk inspectors. The police commissioners of Detroit appoint a milk inspector, with rank of captain, sergeant, or roundsman. He is given authority and required to make inspections in Detroit and Wayne County. Common councils of cities and boards of trustees or councils of villages may appoint milk inspectors with similar powers. It is unlawful to sell unwholesome, adulterated, or impure milk; or swill milk; or colostrum; or milk from cows kept on garbage, swill, or any fermenting or deleterious substance; or milk from cows kept in connection with a family where there is an infectious disease; or milk, skimmed milk, buttermilk, or cream to which water, preservatives, or any foreign substance has been added; or knowingly to sell milk from diseased cows or cows fed on the refuse of a distillery or a brewery. The milk standard is 12.5 per cent milk solids, 3 per cent fat, and a specific gravity at 60° F. between 1.029 and 1.033. Skimmed milk must be plainly marked and have a specific gravity between 1.032 and 1.037.

Public acts of 1895—No. 193 forbids the sale of adulterated food, which term is defined at length.

The dairy and food commissioner issues a monthly report showing in considerable detail the amount and character of the work performed. Each report contains brief statements regarding the conditions of dairies visited during the month in the vicinity of cities and towns throughout the State. The character of the statements concerning dairies can best be shown by quoting one, which refers to an apparently well-managed place, and another referring to one in much need of improvement; they are as follows:

(*a*) Condition of cows, very good and clean; feed, corn fodder, hay, and ground corn and oats; stables, very neat and clean and whitewashed; yard, clean and dry; ventilation, good; water, well; milk room, neat and clean, has cement floor; uses an aerator.

(*b*) Condition of cows, good; feed, fodder, corn, and chops; stables, dirty and dark; yard, muddy and filthy; ventilation, none; water, well.

This system of inspection is said to have had a very beneficial effect upon the milk supply of cities and villages. During the past year 447 dairies supplying milk to 48 cities and villages were reported upon, in the different months, as follows:

Month of inspection.	Cities and villages.	No. of inspections.	Month of inspection.	Cities and villages.	No. of inspections.
January	Lansing	40	September	Flint	16
February	Ypsilanti	8		Holly	2
	Battle Creek	45		Mount Pleasant	1
March	Jackson	57	October	St. Clair	3
April	Adrian	16		Marine City	5
	Hudson	3		Algonac	1
	Waldron	1		Mount Clemens	9
	Hillsdale	6	November	Reading	2
	Jonesville	6		Hillsdale	3
May	Eaton Rapids	4		Adrian	8
	Charlotte	5	November	Union City	2
	Wayne	5		Three Rivers	4
	Northville	2		Cassapolis	2
	Albion	6		Kalamazoo	6
	Marshall	6		Allegan	2
	Grass Lake	1		Benton Harbor	4
	Chelsea	5		St. Joseph	7
June	Saginaw	68		Monroe	3

Month of inspection.	Cities and villages.	No. of inspections.
November	Summerfield Township	2
	Niles	4
December	Port Huron	25
	Pontiac	10
	Lapeer	2
	Wyandotte	12
	Alma	4
	Ithaca	2
	Hart	1
	Frankfort	1
	Cadillac	6
December	Homer	1
	Albion	3
	Jonesville	3
	Manistee	1
	Big Rapids	4
	Eaton Rapids	2
	Total inspections in 48 cities and villages	447

The department has waged a vigorous campaign against the use of preservatives, and reports 49 prosecutions.

Detroit. (Population, 285,704.)

[For comparison with other cities in Class I, see p. 26.]

M. B. Fauykner, milk inspector.

C. L. Stewart, M. D., milk inspector.

The daily consumption of milk is estimated as 15,000 gallons, or 0.42 pint per capita. While the daily receipts of milk are 25,000 gallons, a considerable portion of this is delivered to suburban places and used in the manufacture of ice cream, butter, and cheese. It is also estimated that 2,000 gallons of skimmed milk and 700 gallons of cream are consumed daily. Milk is sold from 700 stores and 230 wagons. Glass bottles are used in the delivery of about half the total supply. Pasteurized milk is used only to a small extent, but its use is increasing. The retail price of milk is 5 cents per quart in summer and 6 cents in winter, the producers receiving 2 cents in summer and 2½ cents in winter. Three "model dairies" near the city sell their product for 7 cents per quart in summer and 8 cents in winter. Within the city limits there are 50 dairy herds, including 250 head. About 500 dairy farms send milk into the city.

A city ordinance of twelve sections, adopted and amended in 1897, regulates the city milk supply. Any person selling milk must have a license for each establishment or vehicle. Every person delivering milk by hand "in quantities less than 1 gallon to each customer" shall wear upon his vest a small shield bearing the number of his license. Licenses are issued annually by the mayor and cost $1 each. Adulterated milk, milk from cows fed on fermented or other unhealthy food, milk produced in places where any contagious disease is known to exist, or any milk that does not come up to the legal standard of 12.5 per cent total solids, 3 per cent fats, and a specific gravity between 1.029 and 1.033 at 60° F., is prohibited. Skimmed milk may be sold if the packages are plainly labeled and if it has a specific gravity at 60° F. between 1.032 and 1.037.

The city expends $1,000 annually in connection with the supervision of its milk supply. One officer, an inspector, gives his entire attention to the work and one chemist part of his time. During the past year 1,219 samples of milk were examined by lactometer and the Babcock test, a part of them being analyzed gravimetrically and 850 of them being examined for preservatives; 12 bacteriological examinations were made for typhoid and tubercle bacilli; and one-half the city herds were inspected. In the two years ended June 30, 1900, 681 samples of milk were examined for preservatives and 43 of them were found to contain formaldehyde and 9 boracic acid. The milk inspector reports the results of the examination for fat and specific gravity of several samples of milk from different breeds and a few samples of fore milk and strippings.

The greatest recent improvement has been in the composition of the milk. There should be more thorough inspection of dairies, veterinary examination of all milch cows, and more care in the handling of the milk supply by producer, middleman, and retailer. Care should be taken not to license a dairy that is not capable of producing good milk.

Grand Rapids. (Population, 87,565.)

[For comparison with other cities in Class II, see p. 30.]

George F. Richardson, milk inspector.

The daily consumption of milk is estimated as 5,000 gallons, or 0.46 pint per capita, besides 500 gallons skimmed milk and 200 gallons of cream. Milk is sold from 51 licensed stores and 228 wagons. About 20 per cent of the retail trade is supplied in glass bottles, and these are filled mostly at the producing farms. The retail price of milk is 5 cents per quart in summer and 6 cents in winter, the producers on the farms receiving 2 cents in summer and 2 to 3 cents in winter. The milk from 7 well-conducted dairies near the city is sold for 6 to 8 cents per quart throughout the year. There are about 1,000 milch cows within the city limits, and milk is sent in from 228 licensed dairy farms. About 5 per cent of the supply is shipped into the city by railway, the longest shipment being 100 miles.

An ordinance adopted in October, 1897, and amended in November, 1897, refers to milk. Licenses for the sale of milk, issued annually, cost as follows: One wagon, $5; each additional wagon, $2; hand carts, $1; cans carried by hand, 50 cents; dairies and creameries, $5; private house, restaurant, etc., $1. But any farmer selling only the milk from his own cows is licensed free. Dairies and dairy herds furnishing milk must be inspected before license is granted. The use of the tuberculin test is authorized. Adulterated, etc., milk is prohibited. The milk standard is 12.5 per cent total solids, 3 per cent fat, specific gravity at 60° F. between 1.029 and 1.033. Skimmed milk must be plainly labeled.

Ordinance section regarding milk license fees is given in Appendix I (p. 178).

About $1,600 is expended annually in the supervision of the milk supply. Two officials—an inspector at $800 and an assistant at $600—give their entire time to this work. During the past year 1,500 samples of milk were examined by the Babcock test for butter fat, and the Westphal balance for specific gravity; no bacteriological examinations were made; all the city cows and all the dairy farms were inspected.

Recent improvements include better methods in the care of cows; greater cleanliness in dairies, and proper aeration and cooling of milk. It is believed an organization of milk producers and dealers should be effected to promote the common interests—encourage better methods, etc.

Saginaw. (Population, 42,345.)

No reply to inquiries was received.

Bay City. (Population, 27,628.)

[For comparison with other cities in Class III, see p. 36.]

W. H. Gilbert, milk inspector.

Daily consumption of milk is estimated as 3,000 gallons, or 0.87 pint per capita. Milk is sold from 8 stores and 28 wagons. Within the city limits there are 3 herds, including 40 cows, besides private cows kept for family use, 1 to 3 in a place. Milk is sent in from about 27 dairy farms within 6 miles of the city.

An ordinance adopted in May, 1898, regulates the sale of milk. Dairies and dairy herds supplying milk must be inspected previous to the issuing of licenses. License fee for the sale of milk is as follows: From wagons, $10 each; hand carts, $3; hand peddlers, $2; dairies or creameries, $5; restaurants, etc., $2; private houses, $1 for each cow. Dairymen outside the city furnishing milk for city peddlers pay no license fee. The sale of adulterated, etc., milk is prohibited. Bottles used in the delivery of milk or cream must be sterilized, and the milk and cream aerated and cooled previous to bottling. The milk standard is 12.5 per cent solids, 3 per cent fat, and specific gravity at 60° F. between 1.029 and 1.033. Skimmed milk containers must be labeled.

During nine months in 1900, 168 samples of milk were examined by the Babcock test; no bacteriological examinations were made; all the city herds and all the dairy farms were inspected.

Jackson. (Population, 25,180.)

[For comparison with other cities in Class III, see p. 36.]

J. C. Harter, food and sanitary inspector.

The daily consumption of milk is estimated as 1,745 gallons, or 0.55 pint per capita. This is sold from 60 stores and 52 wagons. Nearly all the milk is delivered in glass bottles which are filled at the farms. No milk is pasteurized. The retail price of milk is 5 cents per quart throughout the year, producers receiving 2 cents in summer and 2½ cents in winter. About one-half the dairies are said to be conducted in a satisfactory manner, and one to be a "model." Within the city limits there are 8 herds, including 55 cows, and milk is brought to the city in wagons from 59 dairy farms, the longest haul being 6½ miles.

The city milk supply is under the supervision of the food and sanitary inspector. During the past year 220 samples of milk were examined by the Babcock test and gravimetric analysis; no bacteriological examinations were made; all the city herds and all the dairy farms were inspected.

Battlecreek. (Population, 18,563.)

[For comparison with other cities in Class IV, see p. 40.]

E. Cunningham, assistant milk inspector.

The daily consumption of milk is estimated as 1,400 gallons, or 0.60 pint per capita. Milk is sold from 4 stores and 26 wagons. All milk dealers deliver milk more or less in glass bottles, filled some at the farms and some in the city. A small amount of milk is pasteurized and the practice is increasing. The retail price is 5 cents per quart throughout the year, producers receiving 2 cents. Within the city there are 6 herds, and milk is brought in from 70 dairy farms within a radius of 9 miles.

An ordinance adopted in June, 1898, refers to milk. License fee for retailing milk is as follows: Milk wagons, $5; hand carts, hand peddlers, stores, etc., $2; each wagon after the first, $3. Persons having one cow are exempt from license fee. The tuberculin test is authorized in the inspection of cows. Cows must be kept in good sanitary condition and be given wholesome food. Impure, adulterated, etc., milk is prohibited. The milk standard is 12.5 per cent solids, 3 per cent fat, and specific gravity between 1.029 and 1.033. Special license is required for the sale of skimmed milk and buttermilk, and their containers must be labeled.

One hundred and thirty dollars is expended annually in the supervision of the milk supply, one official giving a part of his time to this work. During the past year 560 samples of milk were examined by lactometer and Babcock test; all the city herds and all the dairy farms were inspected.

Recent improvement in the quality of the supply is due to greater cleanliness at dairies and the aeration of the milk.

Lansing. (Population, 16,485.)

[For comparison with other cities in Class IV, see p. 40.]

V. W. Crum, M. D., health officer.

The daily consumption of milk is estimated as 1,000 gallons, or an avearge of 0.49 pint per capita, besides 100 gallons of skimmed milk and 25 gallons of cream. Milk is sold from 3 stores and 22 wagons. About one-third of it is delivered in glass bottles filled on the farms. Only a very small amount of milk is pasteurized, and the practice is not increasing. The retail price of milk is 5 cents per quart throughout the year, producers receiving 2 and 2½ cents per quart in the two seasons. Within the city limits there are 3 herds, including 32 cows, and milk is brought in wagons from 45 dairy farms, the longest haul being 4 miles.

Nine hundred dollars is expended annually in the supervision of the milk supply, one official giving his entire time to this work. During the past year 41 samples of milk were examined by lactometer and Babcock test; 4 samples were examined for tubercle bacilli; all the city herds and all the dairy farms were inspected.

MINNESOTA.

W. W. P. McConnell, State dairy commissioner, St. Paul.

General laws of 1899, chapter 257, amended, and chapter 295; and 1895, chapter 202 and chapter 203, refer to milk, etc. It is the duty of the State dairy and food commissioner to enforce all laws relating to dairy products. Persons peddling milk in cities and towns having 1,000 or more population must, every May, procure a license from the State commissioner at a cost of $1 for each vehicle; and license number, name, and business address shall be shown on vehicles. Stores, booths, etc., are licensed at the same fee. Changes of drivers or other employees must be reported. It is unlawful to sell milk or cream from milk that is unclean, unwholesome, or adulterated, or that has not been cooled or aerated, or to which preservatives or other substances have been added; or milk from cows kept in crowded, filthy, or poorly ventilated stables; or milk from cows having tuberculosis, ulcers, or other disease, or fed upon distillery waste or brewery grains, etc.; or milk from cows less than 15 days before or 5 days after parturition. The milk standard is 13 per cent solids, 3½ per cent fat. The cream standard is 20 per cent fat. Skimmed milk must be plainly labeled. Cans, bottles, etc., used in the transportation of milk over any railway or boat line must be emptied before the milk sours, and then promptly cleaned. Ordinances not conflicting with State laws may be passed by the council of any city, providing for the inspection of milk, dairies, and dairy herds within the city limits, and may require licenses (without fee) for selling milk; and inspectors, experts, etc., may be appointed for their enforcement.

The Penal Code, section 331 amended, provides that whoever adulterates milk with the intent of selling it as unadulterated, or knowingly makes such a sale, is guilty of a misdemeanor.

Dairies numbering 1,025 have been inspected in 129 cities; between 200 and 300 dairies shipping milk to these cities are not inspected.

Forms for recording data regarding milk samples are shown in Appendix IV (p. 203).

Minneapolis. (Population, 202,718.)

[For comparison with other cities in Class I, see p. 26.]

W. D. McCall, milk and bread inspector.

The daily consumption of milk is estimated as 28,000 gallons, or 1.11 pints per capita. This large amount is explained by the common use of milk by the Scandinavian element. It is estimated also that 335 gallons of skimmed milk, 3,536 gallons of cream, and 200 gallons of buttermilk are consumed daily. Milk is sold from about 400 stores and 500 wagons. Only a small percentage of the milk is delivered in glass bottles and these are filled in the city. The trade in pasteurized milk is as yet unimportant. About half of the cream is pasteurized. The retail price of milk is 5 cents per quart in summer and 5 to 6 cents in winter, the producers receiving 2½ cents in summer and 3 cents in winter. Within the city limits there are about 2,500 cows, and perhaps half of them are kept by persons who have only 1 or 2; the total within a radius of 10 miles is 10,000, included in 450 herds. Outside the 10-mile radius there are 50 dairy farms sending milk into the city. One-fifth of the total supply of milk is received by rail, the longest shipment being 75 miles.

An ordinance to regulate the city milk supply was passed by the city council in 1895 and has since been amended three times (twelve sections). A license is required for the sale of milk; applicant must give detailed information regarding the management of the dairy whence his supply. The dairy must be inspected by a veterinarian acceptable to the health commission, and the animals must be examined for tuberculosis and other diseases. For the detection of tuberculosis the use of tuberculin is authorized[a]; this is furnished by the health department free of charge. All inspected animals are tagged to show the presence or absence of infectious disease. Investigation of dairies is reported to the city council before decision as to issuing a license is made. The license is issued without charge; it extends until the first of the following May, but can be revoked for cause. The sale of impure milk or milk from unhealthy animals is prohibited. Cows within the city must be kept clean, and they must not be fed on brewery grains or other food which will cause the milk to be unhealthy, and their drinking water must be pure. No foreign matter shall be added to milk, nor shall any constituent be removed; it must contain 13 per cent solids and 3½ per cent fat. Skimmed milk may be sold if in a vessel plainly labeled.

About $5,000 is expended annually for the supervision of the city milk supply. Three officers give their entire time and 2 part of their time to this work; these include 1 veterinarian, 1 chemist, 1 milk inspector, and 2 dairy inspectors. During the past year 3,022 samples of milk were analyzed by the Babcock test and by gravimetric analysis; a few samples were examined bacteriologically; 92 of the city herds and 99 dairy farms were inspected; 1,516 milk dealers were warned that their milk must be improved, 5 were convicted and fined for watering their milk, 1 was convicted for selling without a license, and 1 firm was convicted and fined for selling a preservative.

In the year 1900, 4,450 cows were tested with tuberculin and only 79 were condemned; this was 1.78 per cent as compared with 9 per cent in 1895, when the use of tuberculin was inaugurated. During the year 43 cows were retested; 33 of them reacted and were condemned.

The form for notice to milk dealers to display license number on delivery wagons is shown in Appendix IV (p. 00).

The most marked recent improvement is shown by the increased willingness on the part of dairymen to have their herds inspected. More well-trained inspectors are needed for the proper enforcement of the law.

St. Paul. (Population, 163,065.)

[For comparison with other cities in Class I, see p. 26.]

W. W. P. McConnell, State dairy and food commissioner.

The daily consumption of milk is estimated as 12,000 gallons, or 0.59 pint per capita, besides about 1,500 gallons of skimmed milk and 1,200 gallons of cream. Milk is distributed from 400 stores and 325 wagons. Glass bottles are used in the delivery of about one-seventh of the supply, and these are filled in the city. Ten per cent of the milk is pasteurized, and this treatment is increasing. The retail price of milk is 5 cents per quart in summer and 6 cents in winter, the producers receiving 1¾ to 2 cents in summer and 2¼ to 4 cents in winter. There are no "model dairies" in the vicinity. Within the city limits and within a radius of 10 miles there are 300 dairy herds, including 6,600 head; 30 other dairy farms send milk into the city. About 20 per cent of the milk supply is received by rail, the longest shipment being 75 miles.

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[a] The right to use tuberculin was confirmed by the supreme court of Minnesota.

City ordinance No. 2042, April, 1899, regulates the milk supply. Every person selling milk is required to hold a license, application for which must be accompanied by a statement giving certain information regarding location, source of milk supply, etc. Sale may commence after application is filed and may continue unless license is refused. The dairy must be examined by an inspector, special attention being given to the health of the cattle, each one being tagged to show its condition. A charge of 50 cents per animal is made for inspection. If the inspector's report is favorable, the license is issued, to be effective one year; license number must appear in milk stores and upon delivery wagons. The use of the tuberculin test is authorized. The sale of adulterated or unwholesome milk, milk taken from diseased or unclean cows, or cows fed on fermented brewery grains or distillery waste, or given impure water, milk kept in unclean vessels or in unsanitary surroundings, or milk containing a preservative, is prohibited. The milk standard is 13 per cent solids, 3½ per cent fat. Skimmed milk may be sold if in vessels plainly labeled. Cows within the city limits must not be overcrowded or kept in badly ventilated stables.

The city expends annually about $2,000 for the improvement of its milk supply. No one official gives his entire time to this work, but various employees of the health department are detailed from time to time. During the past year more than 500 samples of milk were examined by the Babcock test, and those that did not come up to the required standard were subjected to gravimetric analysis; no bacteriological examinations were made; all of the producing dairies were inspected, many cows being examined for tuberculosis.

Lately special attention has been given to the better feeding of the cows, and proper aeration and refrigeration of the milk. Needed improvements include better sanitary conditions, greater care in handling milk, and the sterilization of all milk utensils. It is proposed to have the State provide for the payment for milch cows condemned by the city authorities on account of tuberculosis or other diseases.

Duluth. (Population, 52,969.)

[For comparison with other cities in Class II, see p. 30.]

W. W. P. McConnell, State dairy and food commissioner.

The daily consumption of milk is estimated as 4,000 gallons, or 0.60 pint per capita, besides 100 gallons of skimmed milk and 225 gallons of cream. Milk is sold from 45 stores and 95 wagons. About 3 per cent of the total supply is delivered in glass jars which are filled in the city. No milk is pasteurized. The retail price of milk is 5 cents per quart in summer and 6 cents in winter, producers receiving about 1¾ cents in summer and 2¼ cents in winter. The product of one small "model dairy" is sold for 7 cents per quart throughout the year. Within the city limits there are about 100 dairy herds, including 1,100 cows, and milk is sent in from about 45 dairy farms in Minnesota and 20 in Wisconsin. About 33 per cent of the total supply is received by railway, the longest shipment being 155 miles.

The milk supply is regulated by State laws.

One official is detailed from the State dairy and food commission to Duluth and vicinity to inspect dairies, dairy cattle, milk, and other food supplies. For this work an annual salary of $1,200 is paid. During the past year 400 samples of milk were examined by the Babcock test; no bacteriological examinations were made; all the herds in the city and all the dairy farms except those in the adjoining State were inspected.

Recently there has been a marked improvement in the character of the milk supply, due to an increased interest on the part of producers in furnishing a pure article. Suggested improvements, as given, are the refrigeration of milk during railway transportation and the inspection of milk and cream shipped from the farms out of the State.

MISSISSIPPI.

This State has no milk law.

MISSOURI.

Laws of 1891, page 163, empowers cities and towns "to license and regulate milk dairies and the sale of milk, and provide for the inspection thereof."

The supervision of market milk is left entirely to local authorities.

St. Louis. (Population, 575,238.)

[For comparison with other cities in Class I, see p. 26.]

Henry J. Helwig, M. D., milk inspector.

The daily consumption of milk is estimated as 26,375 gallons, or 0.37 pint per capita, besides 3,000 gallons of cream. No skimmed milk is used. Milk is sold from 1,987 stores and 1,109 wagons. In the delivery of milk, glass bottles are generally used, the greater part of them being filled in the city. Very little milk is pasteurized and there is no increased demand for this treatment. The retail price of milk is 5 cents per quart when delivered from the can and as high as 8 cents when in glass bottles, the producers receiving 2 to 2¾ cents, the price per quart varying according to the percentage of butter fat. Three dairies in the vicinity conduct their business in an especially satisfactory manner, and are paid as high as 12½ cents per quart for their product. Within the city limits there are 400 herds, including about 8,000 cows, and milk is sent into the city from 119 dairy farms.

Ordinance No. 20808, August, 1902, regulates the city milk supply. License to sell milk and cream at retail is $1, in addition to a semiannual license of $2.50 for each delivery vehicle; license to sell at wholesale is $25. The sale of impure, adulterated milk, milk from diseased cows, milk containing any foreign substance, or milk from cows within fifteen days before or twelve days after calving is prohibited. The milk standard is solids, 11.5 per cent; fat, 3 per cent. Cream must not contain less than 12 per cent fat. Skimmed milk (all milk containing less than 10.5 per cent total solids and 1.5 per cent fat) may be sold if in properly labeled containers and if the "Skimmed Milk" sign is displayed on wagons and in stores from which it is sold. Condensed milk must be made from pure milk. Dairies where milk is produced for use in the city must be inspected at least once a month under the direction of the city chemist. Milch cows must be free from disease. Cases of sickness of persons or animals on dairy farms must be reported. Milk must not be exposed to contagious disease, and must be cooled down to 45° F. and maintained at or below 50° F. until delivered to customers. The inspectors must give bonds to faithfully perform their duties and are given the usual authority to enter dairy premises to make inspection.

The city expends annually for the supervision of the milk supply $1,850, and 1 inspector gives his entire time to the duties of the office. During the year, 684 samples of milk were examined by lactometer and the Babcock test, and 72 bacteriological examinations were made for typhoid bacilli. About seven-eighths of the herds within the city limits were inspected. It is admitted that the law is not well enforced. Many of the city dairies are said to use brewers' grains and to be kept in an insanitary condition, and a considerable portion of their cows are believed to be tuberculous.

The composition of the milk has recently improved. There is great need for a State sanitary officer to inspect dairies and dairy herds and to see that they are kept in good sanitary condition.

Kansas City (**including Kansas City, Kans.**). (Population, 215,170.)

[For comparison with other cities in Class I, see p. 26.]

R. H. Hodges, meat and milk inspector.

Population: Kansas City, Mo., 163,752; Kansas City, Kans., 51,418—total, 215,170.

The daily consumption of milk in the two cities is estimated as 25,000 gallons, or 0.93 pint per capita, besides some skimmed milk and cream. Milk is sold from 400 stores and 420 wagons. Glass bottles are used by one large concern and they are filled in the city. Trade in pasteurized milk is unimportant. The retail price of milk is 5 cents per quart in summer and 5¾ cents in winter, the producers on the farms receiving 2½ cents per quart in summer and 3 cents in winter. Two or three specially well-conducted dairies near the city sell their product for 6 cents per quart throughout the year. There are 40 herds, including 700 cows, within the city limits, and about 240 dairy farms send milk into the city. One-fifth of the total milk supply is received by railway.

Sections of the "Revised ordinances of Kansas City of 1898," referring to the milk supply, are Nos. 1015 to 1020, 1023, 1029 (amended by ordinance 11,179, March, 1899), and 1030 to 1035. License is required for the sale of milk or cream, and its number and date of expiration must be shown upon delivery wagon. Persons selling milk must furnish to the board of health a list of their supplying dairies, with a statement showing the location of stables, pastures, etc. The sale of milk or cream that is impure, adulterated, or preserved, or from a cow condemned by the health officer, is prohibited. Required standards are, for milk, 3 per cent fat; buttermilk, 9 per cent solids not fat; skimmed milk, 9 per cent solids not fat. Skimmed milk must be in a vessel plainly labeled, and when sold at retail a gummed label bearing the words "Skimmed milk" must be attached to each vessel into which it is placed. Special attention must be given to milk, cream, and buttermilk served at hotels, etc. A thorough inspection must be made every two months or oftener at all places where milk is produced for sale in the city, careful attention being given to the pastures, feeds, health of the cows, and sanitary conditions. If improvements directed are not made the sale of the milk is stopped. The manufacture, sale, or use in milk of any compound for the purpose of adulteration or preservation is prohibited. Informers are entitled to one-third of fines collected.

Ordinance section regarding inspections of dairies, etc., is given in Appendix I, (p. 179).

About $2,500 is appropriated annually for the supervision of the milk supply. One inspector and one chemist give their entire time to this work. During the past year 2,500 samples of milk were examined by the Babcock test, and deficient samples by gravimetric analysis; 125 bacteriological examinations were made for tubercle bacilli; and all the dairy herds within the city and 200 of the 240 dairy farms were inspected.

Recent improvements in the milk supply are due to the almost entire abolishment of preservatives, to an increase in the percentage of butter fat, and to better refrigeration of milk in transit. Needed improvements include advancement in the price of pure milk, enforcement of the law, and legislation regulating the equipment and conduct of dairies.

St. Joseph. (Population, 102,979.)

[For comparison with other cities in Class I, see p. 26.]

H. N. Keener, M. D., clerk of board of health.

The daily consumption of milk is estimated as 8,562 gallons, or 0.66 pint per capita, besides 4,290 gallons skimmed milk and 100 gallons cream. Milk is sold from 30 stores and 125 wagons. Little if any milk is delivered in glass jars. A small amount is pasteurized under the directions of physicians for special cases. The retail price of milk is 5 cents per quart in summer and 6⅔ cents in winter, the producers receiving 2¼ cents per quart in summer and 2¾ cents in winter. There are no "model dairies" in this vicinity. Within the city limits there are 68 dairy herds, including about 1,000 head, and just outside there are 25 dairies; but the exact number of dairy farms sending milk into the city is unknown. One-eighth of the total milk supply is received by rail, the longest shipment being 50 miles.

The ordinance regulating the milk supply requires every milk and cream dealer to have a license, costing $15 per year, and every person selling milk from only 1 cow to have a license costing $2.50. Every milk dealer must register his license, together with the names and addresses of persons supplying him with milk. The legal standard for milk is 12 per cent solids, 3 per cent fat. Skimmed milk is permitted if purchasers know its character. Informers are entitled to one-third of the fines collected.

No definite fund is appropriated for the supervision of the milk supply, small amounts being set aside at intervals for this purpose. There is no official milk inspector, the little work performed being done by an officer of the board of health. During the past year only 6 samples of milk were examined by lactometer; no examinations were made for bacteria; 12 of the 68 city herds and 18 dairy farms were inspected.

Demand for a better milk supply is responsible for some recent improvement. Needed improvements include thorough inspection of all dairy herds supplying milk and the enforcement of the milk ordinances.

Joplin. (Population, 26,023.)

[For comparison with other cities in Class III, see p. 36.]

J. H. Spencer, mayor.

It is claimed that 50,000 people in and near the city are supplied with milk. The daily consumption of milk is estimated as 3,500 gallons, besides 50 gallons of skimmed milk and 25 gallons of cream. On the basis of the larger population the average consumption of milk would be 0.56 pint per capita. Milk is sold from 21 stores and 32 wagons. Glass bottles filled at the farm are used by one concern in the delivery of milk. The retail price is 5 cents per quart throughout the year. There are 5 especially well-conducted dairies, and their milk is sold at the regular price. There is only 1 dairy herd (25 cows) within the city limits. Milk is sent in from 22 dairy farms, the most distant one being 20 miles from the city.

The city has no milk ordinances.

Nothing is expended by the city for the supervision of its milk supply. During the past year no samples of milk were examined for composition, but the State veterinarian examined nearly all the herds which produce milk for the city and found no tuberculous cows.

MONTANA.

Penal Code, 1895, section 1095, makes it unlawful to keep a milch cow in a crowded or unhealthy place or in a diseased condition, or to feed such cow upon any food that produces impure or unwholesome milk.

Laws of 1901, page 66, refer to the sale of milk. It is unlawful to sell adulterated milk—milk containing any added foreign substance, or milk from a diseased cow. In cities having a population over 5,000 the milk and meat inspector must be a graduate of a veterinary medical college. He must inspect, at least once a month, all dairies supplying milk, and cows must be subjected to the tuberculin test. In cases where they are free from disease, certificates of health are given. Milk must not be exposed to infection from persons having a contagious disease. Milk utensils, etc., must be kept clean. The milk standard is 12 per cent solids, 3 per cent fat, and a specific gravity not less than 1.025.

Butte. (Population, 30,470.)

[For comparison with other cities in Class III, see p. 36.]

J. H. Cronin, sanitary inspector.

It is stated that 75,000 people in and near the city are supplied with milk. The daily consumption of milk is estimated as 7,000 gallons, besides 1,000 gallons of skimmed milk and 100 gallons of cream. On the basis of the larger population, the average consumption of milk would be 0.75 pint per capita. Milk is sold from 12 stores and 35 wagons. About 2 per cent of it is delivered in glass bottles; none is pasteurized. The retail price of milk is 10 cents per quart and cream 40 cents per quart. There are no dairy herds within the city limits. Milk is sent in from 35 dairy farms, the most distant one being 12 miles out. Only 250 gallons is received daily by railway.

A part of the time of one official is given to the supervision of the city milk supply. During the past year 350 samples of milk were examined by the Babcock test. No bacteriological examinations were made. All the dairy farms were inspected.

NEBRASKA.

S. C. Bassett, deputy State food commissioner, Lincoln.

Compiled Statutes of 1897, part 3, chapter 22, section 6898, and Laws of 1899, chapter 35, sections 1 to 4, refer to milk, etc. It is the duty of the State food commission, assisted by county attorneys, to enforce laws relating to milk and cream, and it may exercise control over milk and cream testing. No person shall, with intent to defraud, sell milk that is adulterated or skimmed, or from a diseased animal. Under authority of the law the commissioner has established the following standards: Milk, 3 per cent fat; cream, 15 per cent fat.

General Laws of 1897, chapter 99, forbid the sale of adulterated food, which term is defined at length.

The State food commission has been unable to give any attention to the subject of market milk.

Omaha. (Population, 102,555.)

[For comparison with other cities in Class I, see p. 26.]

L. K. Hutton, milk inspector.

The daily consumption of milk is estimated as 5,740 gallons, or 0.45 pint per capita, besides 200 gallons of skimmed milk and 140 gallons of cream. Milk is sold from 146 stores and 150 wagons. Glass bottles are used in the delivery of about one-fifth of the milk supply. It is estimated that 300 gallons of milk is pasteurized, and the demand for milk so treated is increasing. The retail price of milk is 5 cents per quart in summer and 6 cents in winter. Within the city limits there are 89 herds, including 2,000 cows. Nearly one-third of the total amount of milk used is received by railway, the longest shipment being 75 miles.

The ordinance regulating the sale of milk consists of thirteen sections. A license is required for the sale of milk or cream, the fee being $10 per year for each store or wagon, but persons having less than 10 cows, and delivering by hand from a residence are required to pay only $1 per cow, and persons selling less than 10 gallons of milk per day from a store are required to pay $5. All licenses expire June 30 or December 31. Application for license must be accompanied by a statement giving certain general information. Drivers and employees must hold certificates from the board of health, these to be renewed the same as licenses. Milk wagons must carry a tin plate furnished free by the license inspector and showing license number. The ordinance forbids the sale of milk or cream which is unclean, impure, adulterated; from diseased cows or cows kept in an unclean place, or fed on distillery or brewery refuse, etc.; milk or cream which has been exposed to infection from a sick person or animal; milk from cows within fifteen days before or eight days after calving. The milk standard is 12 per cent total solids, 3 per cent fat. The cream standard is 16 per cent fat. Skimmed milk is permitted if plainly labeled. The milk inspector shall inspect all cows, dairy conditions, etc., where milk is produced for sale in the city. Cases of sickness on dairy farms shall be reported to the board of health. Distillery slops or refuse shall not be kept on dairy premises.

About $1,200 is expended annually in the supervision of the city milk supply. One inspector gives his entire time to this work. During the past year 460 samples of milk were examined by the Babcock test; all of the dairy herds in the city and 15 dairy farms were inspected.

Marked improvements have been shown in the way of cleanliness in the production of milk. Needed improvements, as stated, include the inspection of dairy herds and premises by a competent veterinarian; the whitewashing of barns; and the delivery of milk in sealed packages.

Lincoln. (Population, 40,169.)

[For comparison with other cities in Class III, see p. 36.]

Thomas H. Pratt, city clerk.

The daily consumption of milk is estimated as 3,000 gallons, or 0.60 pint per capita, besides 2,000 gallons of skimmed milk and 200 gallons of cream. Milk is sold from 25 stores; the number of wagons is not known. Five dealers deliver milk in glass bottles, some of which are filled at the farm and some at milk depots. The retail price of milk is 7 cents per quart in summer and 8 cents in winter. Four dairies near the city are conducted in a manner much superior to all others, but their milk is not sold at an extra price. There are no dairy herds within the city limits. Milk is sent in from farms within a radius of 6 miles.

The city has no milk ordinances or regulations.

Nothing has been expended in the supervision of its milk supply, and no examinations of milk samples or inspections of dairies have been made.

South Omaha. (Population, 26,001.)

[For comparison with other cities in Class III, see p. 36.]

Frank E. Jones, milk inspector.

The daily consumption of milk is estimated as 1,108 gallons, or 0.34 pint per capita, besides 30 gallons of skimmed milk and 60 gallons of cream. Milk is sold from 2 stores and 27 wagons. About 5 per cent of the milk is delivered in glass bottles, filled at the farms. At present no milk is pasteurized. The retail price of milk is 5 to 6 cents per quart in summer and 6 cents in winter, the producer receiving 3½ to 4 cents in summer and 4 cents in winter. The milk from 2 dairies, conducted in a very satisfactory manner, commands the highest price. Within the city limits there are 4 herds, including 71 cows, and milk is sent in from 22 dairy farms. One dealer receives milk by railway, the longest shipment being 30 miles.

The milk ordinance of March, 1899, regulates the sale of milk. The milk standard is 12 per cent solids, 3 per cent fat, specific gravity, 1.027 to 1.035, and cream must have 16 per cent fat.

The city expends annually about $1,000 in the supervision of its milk supply, the milk inspector giving his entire time to this work. During the past year 411 milk samples were examined by the Babcock test and lactometer. No bacteriological examinations were made. The city herds were inspected monthly, and all the dairy farms were inspected.

NEVADA.

General statutes of 1885, sections 4801 to 4809, refer to milk, etc. County milk inspectors shall be appointed by the board of county commissioners. It is unlawful, knowingly, to sell adulterated or unwholesome milk or milk from cows fed on distillery, brewery, or hotel waste, called "swill," or impure matter from stalls or stables. Skimmed milk may be sold as such. Cows producing market milk must not be kept in a crowded or unhealthy condition nor given food that will produce impure milk.

NEW HAMPSHIRE.

Public statutes of 1891—chapter 127, amended, refers to milk, etc. Boards of health of cities and selectmen of towns are placed in charge of the inspection of milk, skimmed milk, and cream, and may appoint inspectors to attend to this work. No inspector shall be paid for his services unless he is a registered chemist or holder of a certificate from the dairy department of the State agricultural college. Chiefs of police or county solicitors shall prosecute offenders. A license for the sale of milk, skimmed milk, and cream is required in all cities and towns having milk inspectors. Such license will be issued to any person who shows that he understands the business and gives reasonable assurance that the cows from which his milk is taken are healthy, properly fed, etc. The license costs $2, expires the first of each June, and is revocable for cause. Its number and owner's name must be shown on delivery vehicles and in stores. It is unlawful to sell any milk, skimmed milk, or cream that is adulterated or unwholesome, or contains a coloring matter or preservative, or milk from cows diseased or fed on refuse of breweries or distilleries or other substance which may be deleterious to their product. Milk standard, October to March, is 13 per cent solids, 9.5 per cent solids not fat, 3.5 per cent fat; April to September, 12 per cent solids, 3 per cent fat. Skimmed milk standard is 9 per cent solids not fat. The sale of milk that has been skimmed is prohibited, except from vessels plainly marked. Milk shall be sold by wine measure, and all measures used in selling milk shall have their capacity marked upon them. Milk tests by inspectors and for apportioning payments must be accurate and made by persons holding certificate of competency.

Manchester. (Population, 56,987.)

[For comparison with other cities in Class II, see p. 80.]

Joseph H. Geisel, milk inspector.

The daily consumption of milk is estimated as 4,000 gallons, or 0.56 pint per capita. This is sold from 100 stores and 115 wagons. Almost all the milk is delivered in glass bottles, some of which are filled in the city and some in the country. Very little milk is pasteurized. The retail price of milk is 5 cents per quart in summer and 5 to 6 cents in winter, producers receiving 2½ to 3 cents throughout the year. There are no "model dairies" near the city. There are no herds of milch cows in the city. Milk is sent in from 150 dairy farms, all being within a radius of 18 miles.

State laws regulate the city milk supply.

Three hundred dollars is expended annually in the supervision of the milk supply, one inspector giving a part of his time to this work. During the past year 140 samples of milk were examined by the lactometer.

NEW JERSEY.

George W. McGuire, chief inspector of foods and drugs, Trenton.

Public laws of 1894, chapter 317; 1893, chapter 207; 1891, chapter 210 and chapter 257; 1888, page 461, section 2; 1883, chapter 68 and chapter 185; and an act approved March 21, 1901, refer to milk. The enforcement of the milk laws is charged to the chief inspector, under the direction of the State board of health. City boards of health shall require the registry of all cattle in the different cities, and may order inspections for disease when deemed necessary, and State officials may declare the product of diseased animals unfit for use. A commission is authorized to investigate and provide safeguards against tuberculosis. Cows producing market milk must not be kept in a crowded or unhealthy place, or fed swill or any putrefying substance, etc. Milk must not be exposed to infection from persons having a contagious disease. Samples of milk shall be taken in duplicate, etc., and analyzed at the State agricultural experiment station. Milk changed by the addition of water or other substance shall not be sold in any city of the first class. All cans and bottles in which skimmed milk is sold must be plainly marked. It is unlawful for any person to use a milk can belonging to another without his consent. The sale of food deemed to be impure according to numerous detailed definitions is forbidden.

Very few cities have taken advantage of the State laws regarding milk.

The form for reporting conditions at dairies and methods of handling milk is shown in Appendix IV, (p. 197).

The form for recording inspection of milk depots is shown in Appendix IV (p. 207).

Newark. (Population, 246,070.)

[For comparison with other cities in Class I, see p. 26.]

William H. Lyle, milk inspector.

The daily consumption of milk is estimated at 16,000 gallons, or 0.52 pint per capita, besides 1,200 gallons of cream and a small amount of skimmed milk used by bakers. Milk is sold from 800 stores and 279 wagons. About one-fourth of the supply is delivered in glass bottles, most of these being filled at the producing farms. Little or no milk is pasteurized. The retail price of milk is 6 cents per quart in summer and 7 cents in winter, and the producers receive 2½ cents in summer and 3½ cents in winter. A few well-conducted dairies near the city sell their product for 8 to 12 cents per quart throughout the year. There are in the city 58 herds, including 562 cows, besides 312 cows in private stables. About 500 dairy farms send milk into the city. It is estimated that 60 per cent of the total milk supply is received by rail, the longest shipment being 312 miles.

The sanitary code adopted by the city board of health in June, 1888, contains a few sections (XXVI, LX, LXVI, and LXVII) referring to the milk supply. An annual permit costing 10 cents is required for each animal kept within the city limits, but no license is necessary for the sale of milk. The law requires, also, that all stables and lots where animals are kept be in good sanitary condition, particularly that all manures be removed and the premises kept clean and properly drained. Milk exposed where any communicable disease exists is prohibited.

The city expends annually $2,000 in the supervision of the milk supply. One inspector gives his entire time, and the chemist and bacteriologist of the board of health a part of their time to this work. During the past year 3,508 samples were examined by the lactometer, and 283 by the Babcock test and gravimetric analysis. No bacteriological examinations were made. Only the dairy herds within the city were inspected by city officials, those outside coming under the jurisdiction of the State authorities.

Of the 283 samples of milk analyzed, 185 contained more than 12.5 per cent total solids, 61 contained from 12 to 12.5 per cent total solids, and 37 contained less than 12 per cent total solids, the poorest showing 10.62 per cent. The lowest fat content was 2.4 per cent. As these samples were taken at random, the results of their examination may be understood to show fairly the composition of the entire supply. It is stated that the moral effect of taking samples promiscuously is good. It is the practice of the milk inspectors to take several samples at each place visited, only those suspected being taken in duplicate. The following table shows the results of the analyses made in 1900 compared with those made in the three preceding years:

	1897	1898	1899	1900
Number of samples analyzed	136	178	221	283
First class (total solids over 12.5 per cent):				
Percentage of samples	69.12	70.22	72.40	65.37
Average per cent of total solids	13.24	13.24	13.06	13.24
Average per cent of fat	....	....	3.95	4.06
Second class (total solids between 12.5 and 12 per cent):				
Percentage of samples	21.32	14.15	15.38	21.55
Average per cent of total solids	12.23	12.35	12.27	12.25
Average per cent of fat	....	....	3.60	3.56
Third class (total solids below 12 per cent):				
Percentage of samples	9.56	15.73	12.22	13.07
Average per cent of total solids	11.61	11.58	11.48	11.56
Average per cent of fat	....	....	3.11	3.25
General average per cent of total solids	12.87	12.82	12.75	12.77
General average per cent of fat	....	....	3.80	3.85

Only two samples of milk were found to contain formaldehyde.

The details of the work performed in 1897 in connection with the supervision of the milk supply were reported as follows:

	Number.
Wagons halted for inspection	1,456
Cans of milk inspected on same	3,039
Lactometer tests	1,287
Stores visited	1,472
Depots visited	13
Cans of milk inspected from same	1,385
Lactometer tests	647
Samples submitted to chemists for analysis	135
Samples of ice taken	1
Samples of milk delivered to bacteriologist for analysis	4
Cow-stable inspections	271
Animal permits issued	350
Animals licensed	1,176

The health officer calls attention to the fact that there has been great improvement in the composition of milk since ten years ago, when samples below standard were frequently found to have less than 11 per cent total solids and sometimes as low as 7 per cent.

The forms for recording data regarding milk samples and the form for notification of the taking of a sample are shown in Appendix IV (pp. 205 and 206).

Needed improvements include the enactment of a law requiring dealers to be licensed, and a more thorough and systematic inspection of dairies and dairy products.

Reference is made to a few dairies which produce milk of extra good quality and receive an extra price for it. Special mention should be made of one of these, which for several years has been operated in accordance with an agreement with a milk commission in Essex County. This commission and its work are referred to on pages 173 and 174 of the Seventeenth Annual Report of the Bureau of Animal Industry. Undoubtedly it deserves credit for the high quality of much of the milk sold in the vicinity of Newark, and much credit also for the establishment of milk commissions working along similar lines elsewhere.

The contract between the milk commission and the dairyman is shown in Appendix III (p. 182).

Jersey City. (Population, 206,433.)

[For comparison with other cties in Class I, see p. 26.]

D. W. Benjamin, M. D., health inspector.

John C. Tracy, assistant State dairy commissioner.

The daily consumption of milk is estimated as 12,000 gallons, or 0.47 pint per capita. No skimmed milk is used, but it is estimated that there are 500 gallons of cream consumed daily. Milk is sold from 450 stores and 250 wagons. Glass bottles are used in the delivery of about one-half of the total supply, and these are filled, some on the farms, some at the stores, and some on the wagons. Only a little pasteurized milk is used. The retail price of milk is 6 to 8 cents per quart in summer and 7 to 8 cents in winter. There are no "model dairies" supplying milk to the city. Within the city limits there are 30 herds, including 275 cows; no data is available as to the number of dairy farms sending milk into the city. The greater part of the total milk supply is received by rail, the longest shipment being 250 miles.

The city authorities have made no provisions for the regulation of the milk supply, its supervision being left to the State.

During the past year about 500 samples of milk were examined by lactometer, and some of them by gravimetric analysis; no bacteriological examinations were made; all the city herds were inspected.

It is urged that a competent milk inspector should be appointed to work under the direction of the city board of health.

Paterson. (Population, 105,171.)

[For comparison with other cities in Class I, see p. 26.]

James P. McNair, secretary of the board of health.

The daily consumption of milk is estimated as 8,000 gallons, or 0.61 pint per capita, besides 200 gallons of cream. The use of skimmed milk is not known to the authorities. Milk is distributed from 225 stores; the number of wagons is not known. About one-eighth of the milk is delivered in glass bottles, being the output of four dairy establishments, two in the city and two in the country. Very little milk is pasteurized. The retail price of milk is 6 to 8 cents per quart both in summer and winter, the producers receiving 3 to 4 cents per quart in summer and 3 to 5 cents in winter. There are two establishments near the city, managed in an up-to-date manner, which sell their entire product for 10 cents per quart in summer and 12 cents in winter. Within the city limits there are 84 herds, including 423 cows; the number of the dairy farms sending milk into the city is unknown. It is estimated that 16 per cent of the milk is brought into the city by rail, the longest shipment being 42 miles.

The city has no milk ordinances or regulations.

Nothing has been expended in the supervision of the milk supply, and no examinations of milk samples or inspections of country dairies have been made. The dairies in the city have been inspected.

Needed improvements include the appointment of milk inspectors, the requirement that all milk dealers be licensed by the board of health, and an ordinance establishing a standard for milk and regulating its sale and delivery.

Camden. (Population, 75,935.)

[For comparison with other cities in Class II, see p. 30.]

J. O. George, D. V. S., food and milk inspector.

The daily consumption of milk is estimated as 4,000 gallons, or 0.42 pint per capita, besides 125 gallons of skimmed milk and 100 gallons of cream. Milk is sold from 128 stores and 75 wagons. Two dairymen supply milk in glass jars, using about 700 bottles daily; one fills his bottles in the city, the other at the producing farm. No milk is pasteurized. The retail price of milk is 8 cents per quart throughout the year, producers receiving 3 to 3½ cents in summer and 3½ to 4 cents in winter. There are no herds of milch cows in the city, the milk being sent in from 113 dairy farms. Almost the total supply is received by railway, the longest shipment being 30 miles.

About $1,200 is expended annually in the supervision of the city milk supply. One milk and food inspector and one chemist give a part of their time to this work. During the past year 550 samples of milk were examined by lactometer and by gravimetric analysis; a large number of tests were made for formaldehyde; no bacteriological examinations were made; and no dairy farms were inspected.

Recent improvement is due to the introduction of cows giving richer milk; better feeding; and a more careful handling of the milk. Needed improvements, as given, include a thorough inspection of all milch cows for tuberculosis and better care of the milk.

Trenton. (Population, 73,307.)

[For comparison with other cities in Class II, see p. 30.]

A. S. Fell, M. D., health officer.

George W. McGuire, State dairy commissioner.

The daily consumption of milk is estimated as 4,500 gallons, or 0.49 pint per capita. Milk is sold from 25 stores and 130 wagons. Fifty per cent of the total supply is delivered in glass bottles, some of them being filled in the city and some in the country. No milk is pasteurized. The retail price of milk is 6 cents per quart in summer and 8 cents in winter, the producers on the farm being paid 3 cents in summer and 4 cents in winter. There are 3 well-conducted dairies near the city which receive the regular retail price for their product. There is only one herd of cows in the city, and it includes 20 head. One hundred and fifty dairy farms send milk into the city. About 5 per cent of the total supply is received by railway, the longest shipment being 20 miles.

Nothing is expended by the city in the supervision of its milk supply, this work being under State control. During the past year 100 samples were examined by lactometer and gravimetric analysis; no bacteriological examinations were made; about 20 per cent of the dairy farms were inspected.

Recently the milk supply has been found to be practically free from preservatives, and has shown general improvement otherwise.

Hoboken. (Population, 59,364.)

[For comparison with other cities in Class II, see p. 30.]

Antonio Granelli, health inspector.

The daily sales of milk are estimated to be 8,750 gallons, but these include some duplications, recording the same milk sold both at wholesale and retail. Consequently the average daily per capita consumption is actually less than 1.21 pints, as would appear from the reports. Milk is sold from 243 stores and 24 wagons. The retail price of milk varies from 3 to 6 cents per quart in summer and 4 to 8 cents in winter.

An ordinance passed September, 1897, refers to milk. A permit costing $1 is required for the sale of milk. Milk vessels must be kept clean. Adulterated, impure, etc., milk is prohibited. The milk standard is 12 per cent solids, 3 per cent fat.

Nothing is expended by the city in the supervision of its milk supply.

The inspector recommends that milk be shipped from the farms in sealed packages.

Elizabeth. (Population, 52,130.)

[For comparison with other cities in Class II, see p. 30.]

John C. Tracy, assistant State dairy inspector.

The daily consumption of milk is estimated as 13,062 gallons, or 2 pints per capita. No explanation of this apparently very large consumption of milk is given; it may be due to the fact that some milk is forwarded to other cities. No skimmed milk is used. Milk is sold from 25 stores and 50 wagons. Only a small quantity is delivered in glass bottles and these are filled at the producing farms, and none is pasteurized. The retail price of milk is 6 cents per quart in summer and 8 cents in winter, producers receiving 3 and 4 cents in the two seasons. There are no "model dairies" near the city. Within the city limits there are 10 herds of milch cows, including 100 head, and milk is sent in from 55 dairy farms. A very small portion of the total supply is received by railway, the longest shipment being 5 miles.

An ordinance adopted in March, 1899, supplements the State laws. City cow stables must be kept in a good sanitary condition and be provided with underground manure vaults. Unwholesome milk is prohibited. Milk, when offered for sale, must not be misrepresented.

Nothing is expended by the city in the supervision of its milk supply, this work being under State control. During the past year a number of milk samples were examined by the lactometer; no bacteriologial examinations were made; all the city milch cows and all the dairy farms sending milk into the city were inspected.

Bayonne. (Population, 32,772.)

[For comparison with other cities in Class III, see p. 36.]

A. C. Torman, health inspector.

About 1,800 gallons of milk is used daily, which is an average per capita consumption of 0.50 pint. Milk is sold from 130 stores and 35 wagons. The farthest distance from which it is supplied is 40 miles. Four herds are in the city, including about 125 cows.

The sanitary code of the board of health adopted in March, 1899, refers to milk. Milk venders must obtain a permit costing $2. The sale of adulterated, etc., milk is prohibited. The milk standard is 12 per cent solids, 3 per cent fat.

There is no milk inspector and no samples of milk have been examined for composition, but all the city herds have been inspected.

Atlantic City. (Population, 27,838.)

[For comparison with other cities in Class III, see p. 36.]

H. C. Beck, health inspector.

Milk is sold from 30 stores and 50 wagons. Glass bottles, filled mostly in the city, are used extensively in the delivery of milk. Little or no milk is pasteurized. The retail price of milk is 8 cents per quart throughout the year, producers receiving 4 cents per quart. There are a few well-conducted dairies near the city, but their product is not sold at an advance in price. The total milk supply is received by railway, the longest shipment being 50 miles.

Nothing is expended by the city in the supervision of its milk supply, this work being under State officials.

Passaic. (Population, 27,777.)

[For comparison with other cities in Class III, see p. 36.]

J. Payne Lowe, D. V. S., veterinary inspector.

The retail price of milk is 5 to 8 cents per quart throughout the year. The milk from one "model dairy" is sold at an advanced price. Within the city limits there are 43 herds, including 122 cows. Over two-thirds of the total milk supply is received by railway, the longest shipment being 100 miles.

The veterinary inspector gives a part of his time to the supervision of the milk supply. During the past year samples of milk were examined by the lactometer; no bacteriological examinations were made; all the city herds were inspected, but none of the dairy farms.

It is urged that some provisions be made by which health authorities in the districts where milk is produced would report upon conditions of herds, methods of handling milk, etc.

New Brunswick. (Population, 20,006.)

[For comparison with other cities in Class IV, see p. 40.]

Henry R. Baldwin, M. D., president of the board of health.

The daily consumption of milk is estimated as 1,250 gallons, or an average of 0.50 pint per capita. Milk is sold from about 30 stores and 30 wagons. About one-fifth is delivered in glass bottles, and these are filled at the farm. Pasteurized milk is used only to a limited extent. The retail price of milk is 4 to 6 cents per quart in summer and 5 to 8 cents in winter, producers receiving 3 cents and 3½ cents in the two seasons. The milk from one "model dairy" is sold for 6 cents in summer and 8 cents in winter. Within the city limits there are 5 herds, including 70 cows, and milk is sent in from about 55 dairy farms, all within 6 miles of the city.

The city has no milk ordinance.

Nothing is appropriated by the city for the supervision of its milk supply. During the past year 3,500 samples were examined by the Babcock test, and 2 of the 60 dairy herds were inspected. The sale of milk from the well-conducted dairy belonging to the State agricultural college has had a marked effect in bringing about improvement in the city supply.

Recent improvement in the milk supply is due to better care and feeding of cows and to greater cleanliness of dairies.

Montclair. (Population, 13,962.)

[For comparison with other cities in Class IV, see p. 40.]

M. O. Leighton, health inspector.

The daily consumption of milk is estimated as 860 gallons, or 0.49 pint per capita. Little or no skimmed milk is sold. Milk is sold from 12 stores and 32 wagons. All the milk is delivered in glass bottles and almost all of these are filled at the farms. No milk is pasteurized. The retail price is 7 to 12 cents per quart throughout the year, producers receiving 2 to 3½ cents. The milk from 6 "model dairies" is sold for 8 to 12 cents per quart. Within the city limits there are 4 herds, including 35 cows, and milk is sent in from 24 dairy farms. About 20 per cent is received by railway, the longest shipment being 400 miles. Quite a large part of the supply comes from Chenango County, N. Y.

An ordinance adopted in March, 1898, refers to milk. Persons selling milk must register with the board of health. Cow stables must be properly located and constructed and be kept clean. Cows must be free from dangerous disease, be kept clean, and their udders washed and wiped before each milking. Attendants must personally be clean and not exposed to contagious disease. Milk must be removed to separate room at once after milking and be cooled in water. Milk utensils must be washed in pure water and soda or soap, and be sterilized.

The milk ordinance is given in full in Appendix I (p. 175).

About $300 is expended annually in the supervision of the milk supply, two officials giving a part of their time to this work. During the past year 166 samples of milk were examined by lactometer, Babcock test, and gravimetric analysis; the same number was examined for bacterial content; all the city herds and all the dairy farms were inspected each month. The results of chemical and bacteriological examinations of milk and accounts of conditions found at dairies are published in the annual reports of the board of health, together with the names and addresses of the dairymen whose products and places are referred to. The reports are widely distributed, and read by many citizens. The statement of the conditions found at one dairy is as follows: Large, light stable; good drainage, and kept in excellent condition. Cement floors and drops. About 20 cattle, regularly attended by a veterinarian. Milk cooled over patent cooler and bottled immediately. Utensils sterilized with steam.

The supervision by the milk commission, referred to in the statement under Newark, extends to a portion of the milk sold in Montclair, and has had considerable effect in raising the standard of the supply of this city.

Recent improvements are due to the observance of better methods at producing dairies. Further improvement would undoubtedly follow if the actual facts in connection with different dairies were published in the newspapers.

In a paper upon "The importance of bacterial counts in the sanitary supervision of milk supplies" the health inspector presents, in an interesting manner, the results of his study of the subject. His investigations extended over a period of two or three years, and proved to his satisfaction that the sanitary condition of dairies can be safely judged by the number of bacteria in the product. All the samples of milk which he examined in this connection had been bottled at the dairies, and so far as possible they were taken from the evening milking, their age, when examined, being twelve to fifteen hours; in some cases they were older. Regarding his experiments and conclusions he writes as follows:

"The time covered by the work is three successive years from September to June. The bacteria were grown upon gelatin, and each culture was allowed to grow nearly to the point of liquefaction so that the slow-growing colonies would have all the time possible to increase to the counting size.

TABLE 1.—*Average results.*

No. of specimen.	Number of bacteria.	No. of specimen.	Number of bacteria.	No. of specimen.	Number of bacteria.
1	5,006	7	28,654	13	182,012
2	8,770	8	41,629	14	257,004
3	9,900	9	50,320	15	Uncountable.
4	13,762	10	62,269	16	Uncountable.
5	14,250	11	65,633	17	Uncountable.
6	21,012	12	69,978		

"Table No. 1 contains the average results of the determinations for each dairy during the whole term. Examination shows that the figures range from 5,006 in No. 1 to uncountable in the last three; also that the list divides itself into three classes: Nos. 1–5, or those having a count below 15,000; Nos. 8–12, or those running from 40,000 to 70,000; and, after a long interval, those dairies having an average of 180,000 and upward. Nos. 6 and 7 do not appear to be in any class, having a position intermediate between the first and second classes. A possible reason for the eccentric position of these two dairies may be drawn from considerations which are to follow.

"Table No. 2 includes the results of the examinations which, taken together, make the averages for the dairies in the first class above described.

"The number of the dairy according to its succession is set at the top of the record of determinations, while the average in each case is set at the bottom.

TABLE 2.—*First class; individual results.*

No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
2,366	9,500	6,800	2,000	96,700
5,800	1,900	6,400	4,200	7,700
5,800	11,600	3,500	6,200	25,250
5,000	22,500	2,200	12,700	12,900
3,600	4,300	34,700	11,200	8,300
2,800	6,300	2,800	8,800	2,000
8,000	16,800	12,000	34,600	3,600
4,000	9,600	30,300	29,600	1,500
3,400	13,500	10,900	....	2,800
3,500	8,000	7,600	....	21,200
6,700	13,300	1,600	....	18,400
5,800	17,600	3,800	....	7,300
5,800	600	7,300	....	6,300
5,450	700	8,700	....	6,100
6,600	3,620	....	....	16,800
4,600	3,620	....	....	6,800
5,100	11,560	....	....	8,600
....	9,840	....	....	....
....	4,300	....	....	....
....	5,300	....	....	....
5,006	8,770	9,900	13,762	14,250

"Representing dairy No. 1 are the results of seventeen examinations, ranging from 2,366 to 8,000, and showing a remarkable degree of uniformity throughout. It is evident that whatever may be the conditions to produce these results, those conditions are uniform. This seems to be exemplified, though less imperfectly, in the remaining columns of the table. Note in No. 2 that some of the determinations are lower than any in No. 1, but there is a wider range of figures, and some of the determinations are above the 15,000 limit which marks this class. Nos. 3 and 4 are similar. No. 5 starts with the abnormally high count of 96,700, but does not approach it again in the remainder of the list. It is evident that a remarkable change took place in the conditions within and surrounding this dairy after the first examination.

"Inspection of the dairies which these diagrams represent would show that Nos. 1, 2, and 4 are very similar, and are of the highest type of dairy excellence. The stables are built upon elevated situations, where good drainage can be secured. Inside the stables there is ample provision for light and ventilation, while the floors and manure troughs are built in such a manner and of such materials as will facilitate cleaning. The cattle in these stables are carefully groomed, fed upon wholesome food, and regularly attended by a veterinarian. The attendants employed are kept personally clean, and are provided with every facility for maintaining their cleanly condition throughout the milking period. Of highest importance are the dairy houses in connection with these first three establishments. In them are provided tight steam chests, in which all utensils necessary in the preparation of the product for the market are exposed to steam under pressure and thoroughly sterilized. The other principal features in connection with the dairy houses are the coolers over which the milk flows as soon as it is drawn from the cows, from whence it goes to the bottler and is bottled immediately.

"Dairy No. 3 differs from the first two and the fourth only in this respect: The milk is raised by different farmers in a district, who sell it to a company which takes charge of the bottling and final delivery to the consumer. The condition of all branches of the process is, however, in no wise different in its sanitary and hygienic features from Nos. 1, 2, and 4.

"Dairy No. 5 differs from the first four in that the latter are the results of the expenditure of a large amount of money. There have been installed within them numerous devices to produce facility and economy, as well as cleanliness in handling the product. From this it might be supposed that it is only in dairies of this character that we are able to procure low counts. Such, however, is not the case. Of course, it is easier to keep clean in a palace than in a hovel, yet it must be admitted that cleanliness is not an impossibility even in the latter place. Dairy No. 5 consists of low, old-fashioned stables, which at first glance exhibit nothing favorable, but within which close inspection will reveal the vigilance of the owner. In spite of the rough projections, innumerable cracks, and all the disadvantages common to country stables, there are evidences of care and attention everywhere. The explanation to him of the first high results noted at the beginning of the record brought about all the alterations suggested. The owner is an ideal dairyman in spite of his poverty.

TABLE 3.—*Individual results.*

No. 6.	No. 7.	No. 6.	No. 7.
59,600	6,100	38,000	41,900
20,500	6,600	45,000	81,600
1,290	4,400	48,000	101,500
10,300	4,750	12,400	....
2,300	12,300	13,500	....
2,600	25,300	2,900	....
22,800	10,300	3,400	....
16,000	13,500	21,012	28,654
37,600	35,600		

"Considering, now, the two dairies which were intermediate between the first and second classes, it will be seen that for dairy No. 6, in the table immediately above, there are widely varying results, generally high and spasmodically low; a column of figures without uniformity and with extremes which are bewildering when compared with the table of the first class of dairies.

"It has been observed that costly stables and expensive equipment are not indispensable for procuring clean milk and low bacterial counts. It is also true that the possession of all these does not insure the best results. Number 6 is a dairy which should belong to the first class, having clean, light, well-made stables and carefully chosen cattle, and a complete sterilizing and bottling equipment. At first thought it contradicts what has gone before, but if one should watch the dairy in operation for several days he would learn that the proprietors have many interests outside of the dairy inclosure, and are fond of many diversions. Consequently, the work is too often left without their care, and the employees, being possessed of their full complement of human frailties, are not in good form at those times. Milking is done carelessly, cooling and bottling deferred, and cattle go ungroomed. Vigilance there comes only in spasmodical waves.

"In dairy No. 7, Table 3, the list starts out very evenly, with low counts, which would, if continued, have placed the dairy well within the first class. The premises at first presented a neat, wholesome appearance, quite in keeping with the record made at that time. Those who are acquainted with the owner know that he has experienced sorrow in his family and adversity in his worldly affairs; a man who has, under the stress of this condition, become careless and indifferent. The ready-made sound which this statement has is quite appreciable to the writer, yet these conditions do actually exist and are well known in the neighborhood in which he lives. The stables, once a model of neatness, have gradually assumed a meaner aspect, and the cattle, once so well-rounded, have become rough, ill-kempt, and angular. The man's condition is stamped upon his features, is evident in his personal appearance, and can be seen even in his driveway and door-yard. From the foregoing it therefore becomes plain that low results, coincident with prosperous times and the high ones which followed adversity, make an average which conforms neither to the one condition nor to the other.

TABLE 4.—*Second class; individual results.*

No. 8.	No. 9.	No. 10.	No. 11.	No. 12.
16,600	36,750	390,000	72,600	33,300
16,100	72,600	9,850	15,700	35,100
61,800	7,800	7,600	19,937	23,000
64,350	299,450	7,700	126,300	44,350
19,600	16,200	81,700	107,500	400,000
14,000	39,000	9,600	85,500	40,000
120,000	10,700	8,800	83,200	42,400
80,000	16,000	82,900	125,400	60,000
50,100	20,800	....	93,600	55,000
48,300	13,500	....	42,000	76,300
41,000	7,800	....	43,300	81,200
43,000	9,000	....	16,900	12,900
....	30,100	....	17,800	6,100
....	99,000	....	....	....
....	86,100	....	....	....
41,629	50,820	62,269	65,633	69,973

"Passing to the second class of dairies, it is seen from Table No. 4 that the averages extend from 41,629 to 69,973. Those who have been engaged in dairy inspection, even to a small extent, know that dairy farmers as a class are poor in money but wonderfully rich in good intentions. There are many old stables which are kept very clean with shovel and broom, and in which cattle are treated according to the golden rule. There are supplied no sterilizer, no improved cooler, no chert[a] floors, but the farmer is always doing his best with the means at his disposal. He cools his milk by standing the can containing it in a tub of water; he washes his utensils as clean as possible with water and soap, and he keeps himself and his employees personally clean. Such cases are common, where a man tries to compensate with muscle labor for that which he has not money to purchase. Such instances are represented in the second class. In the results there is little uniformity; occasionally there is a low count which seems to be the result of a happy combination of good effort and good fortune. And so it is that there is lacking in the records of these dairies the uniformity which appeared so distinctively in Table No. 2. Favorable conditions come and go in the dairy business, just as in other vocations, and with no devices with which to overcome the numerous difficulties which arise before one who attempts to produce an honest product, there can not be placed any great dependence upon the uniform excellence of the milk.

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[a] Chert floor is a smooth cement floor.

"A comparison between these dairies and dairy No. 5 is instructive. Structurally, the former are generally no poorer than the latter, yet if we look closely into the existing conditions we will find that in these stables of the second class the whole atmosphere is inferior. The cattle look rougher and dirtier, accumulations of manure will more often collect upon the sides of the stables, the milk bottles, when ready for filling, shine less brightly, and the owners themselves appear not as tidy as the owner of No. 5. The matter of personal appearance in a dairyman is extremely significant in indicating the quality of that man's product. If the owners of the dairies here described should be arranged in a line according to their personal appearance the order of succession would very closely follow the bacterial order here given:

TABLE 5.—*Third class; individual results.*

No. 13.	No. 14.	No. 15.	No. 16.	No. 17.
72,600	48,000	Uncountable.	431,900	114,300
59,400	299,000	80,000	275,500	19,550
404,700	178,000	62,400	17,300	22,800
455,000	583,000	120,800	12,500	156,000
37,600	720,000	60,000	Uncountable.	53,000
33,800	800,000	Uncountable.	19,900	Uncountable.
25,300	120,000	Uncountable.	20,500	Uncountable.
67,700	160,000	....	130,000	....
....	22,000	....	Uncountable.	....
....	25,600	....	17,000	....
....	31,500	....	....	....
....	96,000	....	....	....
182,012	257,004	....	....	....

"The consideration of the third class of dairies introduces the discussion of the two factors which lie at the bottom of conditions in dairies totally bad. The first is dense ignorance and total unfitness of the man for the business; men who, perchance, have failed in every other capacity by which they have been measured during life; men of foul habits and disgusting personality, whom we would not tolerate in the meanest capacity about our homes or in our places of business. Such are the men who take a part in the production of one of our most important food supplies. The second factor responsible for bad results in a dairy is vicious indifference and sordid opposition to decency on the part of producers who are really intelligent and capable. With these it is considered meritorious to violate, as far as is legally safe, the ordinance and wishes of the sanitary authorities. To such people the voice of an instructor of hygienic dairying is ever the voice of a meddlesome oppressor, and is to be met only by opposition.

"A good example of the results obtained by the totally ignorant dairyman may be seen in the record of No. 14. The owner of this dairy is good natured, stupid, and lazy, and is therefore a hard man to manage. He seems perfectly willing to lie down and be kicked at any time, and then, bearing you no ill will, and doubting not the wisdom of your procedure, he will go on just as before. The improvement that is noted in the latter part of his record is the result of extensive structural improvements in the stable. But as the effect of renovation gradually wore away, and the man relapsed into long-imbued habits, the record took a corresponding trend toward the old high average.

"In conclusion it may be said, that the correspondence which exists between the results of the numerical determinations of bacteria and the conditions under which each supply is produced, are most striking when the dairies themselves are visited. Verbal descriptions and pictorial presentations are inadequate to complete in the mind the principle involved. These determinations, as well as the results of the physical and chemical tests, have been published, each under the name of the dairyman in the annual reports of the Montclair board of health. They have brought the facts before the people in no uncertain manner, and the people have profited largely from it. Those who have appeared favorably in these reports have been blessed with increased trade, while on the other hand, many of the slovenly ones have found their business unprofitable. In addition to this, the improvements which have been made to the dairies, both in structure and in methods of procedure, are too numerous to mention here. Laws and ordinances accomplish their part in bringing our milk supplies up to the point where they are respectable, but it has been the experience of the writer that nothing is quite so effectual as fearless, truthful publicity.

"From the foregoing results, we are able to come to but one conclusion—i. e., that the number of bacteria per cubic centimeter in a given sample of milk forms an absolute indicator, by which the care and cleanliness to which the product has been subjected from the time it is drawn to its delivery into the hands of the analyst may be determined. In reply to the authoritative statements mentioned in the beginning, the writer can simply point to these results and declare that if all this be coincidence, then coincidence must be predetermined."

NEW MEXICO.

Compiled laws of 1897—sections 1244 to 1257 refer to foods. No person shall knowingly sell a damaged or altered food without the purchaser being fully informed.

NEW YORK.

Charles A. Wieting, commissioner of agriculture, Albany.

Laws of 1893, chapter 338 (chap. 33 G. L.), article 1, sections 1 to 12, and article 2, sections 20 to 25, amended, refer to milk. The State department of agriculture is charged with the execution of laws relating to agricultural products. Samples must be taken in duplicate, etc. No person shall sell adulterated milk, meaning milk that is from cows within fifteen days before and five days after parturition, milk from animals fed on distillery waste or any putrefying substance, milk from cows in crowded or unhealthy condition, or milk to which water or any foreign substance has been added. Preservatives are prohibited. Pure milk is defined as sweet and unadulterated; pure cream is that taken from such milk. The milk standard is 12 per cent solids, 3 per cent fat. Except in New York and Kings counties, skimmed milk is permitted when clean and wholesome and sold for what it is, but it can be sold only in the county where produced or an adjoining county. Milk cans, etc., holding market milk and rooms where it is stored must be kept clean and sanitary; but this provision does not apply to cities of the first class. No person shall use the cans of another without the owner's consent, or remove therefrom or mar his name or mark. Condensed milk must be made from pure and wholesome milk, a standard being fixed, and all packages shall be labeled with the name of the manufacturer, etc.

Laws of 1901, volume 2, chapter 429: Impure, unhealthy, adulterated, etc., milk must not be supplied to butter or cheese factories. Babcock glassware used in making milk tests for the basis of payment must first be examined and marked by the director of the New York agricultural experiment station.

For the purpose of enforcing the laws and performing other work charged to it, the department of agriculture has placed an assistant commissioner in each of the 10 divisions into which the State has been divided, and among other duties these officials execute State laws relating to milk. They do not collect statistics relative to city and town milk supply, but so far as possible, they inspect milk sold in cities and towns, and visit milk stations for the purpose of inspecting milk, etc., always going to such stations when requested to do so. Their visits are irregular. Milk is tested with lactometer, and, if suspicious, duplicate samples are taken for analysis—one for the State and one for the owner. Inspectors visit farms suspected of being in bad order. Bacteriological examinations are ocassionally made by the analysts at the State agricultural college.

In some of the large cities the department's agents inspect milk almost daily. In Albany the department has a wagon especially fitted up with facilities for making quick tests, and it is out each day, sometimes going to neighboring towns. Usually the milk in every can in the peddler's wagon is tested. In one summer month 740 cans were examined in Albany and only 3 suspected samples taken. Agents send detailed reports of work done to the department each week.

The number of prosecutions under the milk law in District I, including 7 counties in the central eastern portion of the State in the year 1900, is shown by the following:

Troy	13	Schenectady	10	Cohoes	3
Albany	15	Mechanicsville	1	Stillwater	1
East Greenbush	3	Round Lake	1	Amsterdam	1
Milford	3	Eagleville	1	Richfield	1
Beckmanstown	3	Pepacton	4	Rensselaer	2

New York. (Population, 3,437,202.)

[For comparison with other cities in Class I, see p. 28.]

Herman Betz, M. D., acting chief inspector, division of food inspection.

C. Golderman, secretary pro tem of the department of health.

The daily consumption of milk, as computed in the year 1901, was 333,856 gallons, or an average of 0.78 pint per capita, besides 4,000 gallons of cream. No skimmed milk was used. In reference to this apparently large consumption of milk, the following explanations are offered: There is a floating population in New York City of at least 300,000. About 150,000 persons living in outlying districts spend the business hours in the city; shoppers from neighboring towns and states number about 50,000 per day; there are many public institutions where milk is used largely in the daily diet; persons of some nationalities use much milk on account of its cheapness; and a large amount is taken out of the city by dining cars and vessels.

Milk is sold from about 12,000 stores and 4,000 wagons. About one-sixth of the supply comes to the city in bottles which are filled in creameries and bottling plants in the country, and which are generally shipped in boxes holding 12 quarts each. Probably as much more milk is bottled in the city. Perhaps 5 per cent of the total amount is pasteurized, and this treatment is increasing in favor. The retail price of milk is 6 cents per quart in summer and 8 cents in winter, producers receiving 2¼ to

3 cents in summer and 3 to 3¾ cents in winter.[a] The milk from a few "model dairies" is sold throughout the year for 12 to 15 cents per quart. There are within the city limits 5,500 "herds," including 23,200 milch cows; 3,500 dairy farms send milk into the city. Eighty-five per cent or more of the total supply is received by rail over a dozen different lines, the longest shipment being 350 miles.

Section 59, and 63 to 67, inclusive, from the sanitary code of laws, govern the sale of milk. In addition to these, regulations and rules have been adopted. No milk shall be received or sold without a permit from the board of health. Permits must be conspicuously posted in stores and carried in wagons, which latter must show wagon number and permit number preceded by the words "Department of health." Unwholesome or adulterated milk; "swill milk;" milk with any added foreign substance; milk from animals kept for the most part in stables, or fed on distillery waste; and milk from diseased cows, from cows within fifteen days before or five days after calving, or from cows kept in a crowded or unhealthy condition, is prohibited, and may be seized and destroyed. The milk standard is 12 per cent solids, 3 per cent fat. Skimmed milk or milk from which any part of its cream has been removed is prohibited. Condensed milk must be made from pure milk, 25 per cent of the milk solids must be fat, and no foreign substance except sugar can be added. Cream must be from pure milk and contain no foreign substance. Milk must not be transferred from cans to other vessels on the streets, or ferries, or in depots, except when "transferred to vessel of purchaser at time of delivery." Vessels in which milk is kept must be covered so as to exclude dust and other impurities. Milk must not be kept for sale, nor bottled in a room used for sleeping or domestic purposes, nor in a room opening into the same. Before use, milk bottles must be washed with a hot-water cleaning solution and then with hot water; they may be filled only at the dairy or creamery or in a room in the city properly protected to prevent contamination from dust. Eight rules published with the ordinance and regulations refer to certain miscellaneous details, such as the storage of the milk, the construction and care of the ice box, the use of ice in milk, etc. In a short circular intended to be sent to milk dealers whenever occasion arises, the health department calls special attention to a few important requirements of the law, principally in reference to adulteration.

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[a] The following statistics are taken from the Milk Reporter:

Total number of cans of milk, cream, and condensed milk received in the New York market monthly during 1902, and the average price of milk per quart each month.

1902.	Cans of milk (40 quarts).	Cans cream and condensed milk (40 quarts).	Average price of milk per quart.
			Cents.
January	796,128	29,285	3.38
February	720,723	30,405	3.25
March	835,240	36,009	3.04
April	826,475	38,654	2.87
May	917,438	54,303	2.63
June	924,101	59,020	2.25
July	927,825	57,533	2.25
August	874,488	50,318	2.42
September	852,461	40,368	2.50
October	869,318	35,143	3.00
November	831,766	31,820	3.25
December	821,424	30,849	3.75
1902 Total	10,197,387	493,707	....
Average	27,938	1,352	2.88
1901 Total	9,757,835	460,334	....
Average	26,734	1,261	2.62
1900 Total	9,388,947	422,754	....
Average	25,741	1,156	2.74

Rules and regulations governing the sale of milk are given in full in Appendix I (p. 165).

The amount expended annually in the supervision of the milk supply is included in the general appropriation to the department of health and can not be stated separately. Twelve officials—inspectors, chemists, and assistant chemists—give their entire time to this work. During the last year of record 78,344 specimens of milk were examined; 1,313 samples were collected for analysis; 448 quarts of adulterated milk were destroyed; 560 of the 5,500 city dairy herds were inspected; 6,843 cows were examined; and 127 cows were condemned. Published reports for other recent years show much more work along these lines; for example, the report for 1899 (pp. 63 and 71) contains the following:

Milk inspections.

	Number.
Inspections	51,498
Specimens examined	50,457
Samples of milk	945
Citizens' complaints received	286
Original complaints by inspectors	81
Citizens' complaints returned for orders	37
Citizens' complaints returned as negative	225
Citizens' complaints under observation	2
Days at court or department	2,757
Special day inspections	10,310
Early morning inspections	335
Nights of special work	48
Quarts of adulterated milk destroyed	95
Days in country or at laboratory	559
Arrests	193
Held on bail	185
Discharged	20
Trials at special or general sessions	180
Amount of fines	$4,285

Inspection of cows.

	Number.
Inspections of premises	15,650
Herds examined	461
Cows tagged	2,434
Temperatures taken	22,421
Cows examined (tuberculin test)	2,580
Cows examined (tuberculin test), negative	2,513
Cows found diseased	66
Cows condemned	62
Autopsies	59
Citizens' complaints received	75
Citizens' complaints returned for orders	5
Citizens' complaints returned as negative	68
Citizens' complaints under observation	1
Original complaints by inspectors	3
Days at court or department	957
Nights special work	594
Analyses	5,115
Experimental analyses	764
Lactometers tested	71
Thermometers tested	15
Days at court or department	1,422

The form for application to sell milk and the special-information form for milk sellers are shown in Appendix IV (p. 192).

The forms for milk-store permit and milk-wagon permit are shown in Appendix IV (p. 200).

The department of health has issued two instructive circulars regarding the production of pure milk and the proper manner of handling it. Mention should be made also of the milk commission of the medical society of the county of New York, which has undertaken to increase the supply and demand for high-grade milk. The work of this commission has already shown very satisfactory results. It is referred to at length in an article entitled "Market milk: A plan for its improvement," which was published in the Seventeenth Annual Report of the Bureau of Animal Industry.

The Rockefeller Institute for Medical Research early declared one of its purposes to be attention to matters of public hygiene and a study was made by it, in 1901, of some of the questions relating to the milk supply of New York City. A partial report has been published of the work accomplished. Special attention was paid to the bacteria in the milk supply of the city, with reference to the number and character of these germs at different times and the changes which occur between the milking of the cows and the delivery to consumers. An attempt was made to examine the conditions prevailing at producing farms, but the number visited was so manifestly inadequate and the inspections made were of such a character, judged from the report, that this branch of the investigation was merely suggestive in its result, and somewhat misleading. Much more practical in plan, more efficient in execution, and more effective in result was a systematic investigation of the manner in which infants living in tenement houses in the city were fed upon milk during the hot months. The reporters for the institute concluded that the most hopeful work in improving the milk supply of this city was being done through the milk commission already mentioned and by the efforts of a few milk-supply companies and some enterprising individual dealers.

There has been recent decided improvement in the composition and cleanliness of the milk supply. Needed proposed improvements include regular inspections of farms and dairies, especially at milking time; animals to be kept under more sanitary conditions; stables to be cleaner; milk to be shipped as soon as possible after milking.

Buffalo. (Population, 352,387.)

[For comparison with other cities in Class I, see p. 28.]

Edward Clark, M. D., and William B. May, M. D., milk inspectors.

The daily consumption of milk is estimated as 31,000 gallons, or 0.70 pint per capita. The daily consumption of skimmed milk is estimated as 10,000 gallons. Milk is sold from 1,200 stores and 529 wagons. About one-third of the supply is delivered in glass bottles, and these are filled in the city stores. A limited amount of pasteurized milk is used. It seems to be gaining in favor. The retail price of milk is 6 cents per quart throughout the year, the producers receiving on the farm 2½ and 3 cents, respectively, in the summer and winter seasons. The product of a few dairies in the vicinity of the city which are conducted in an up-to-date manner is sold for 7 cents per quart throughout the year. Within the city limits there are 22 herds of milch cows, including 340 head. Milk is sent into the city from 656 dairy farms.

The city ordinances relating to the supply and distribution of milk are quite lengthy. The sections on this subject, as published by the department of health in 1897, are Nos. 9, 87-97, 100, 237, and 238. A permit must be obtained from the department of health (fee, $1) for keeping cows within the city limits, but no person can keep more than 1 cow unless his "premises are in proportion of 1 acre of land to each and every cow above the number of 1." No person can bring milk into the city for sale without a written permit from the health department (fee, $3); permit will not be issued until a satisfactory statement showing applicant's residence, number of cows, etc., has been filed. A license from the mayor is required for selling milk; the fee for each vehicle is $2. Licenses and permits must be renewed each May; they are revocable for cause. Retail dealers, grocers, and bakers must display a sign showing from whom their milk is obtained. Milk wagons must show license numbers, etc., and in summer months must be covered. The law prohibits the sale of impure or adulterated milk, including the product of diseased cows and "cows that for the most part are kept tied up in the stables," and cows fed on garbage or other improper food. The milk standard is 12 per cent solids, 3 per cent fat, 1.029 specific gravity. Skimmed milk may be sold if in a plainly marked vessel and does not contain a less percentage of casein and salts than is contained in whole milk. The construction of milk rooms and milk boxes must conform to prescribed regulations. Milk cans must be cleaned before being returned to the dairy. The removal of milk bottles from a house where a contagious disease exists and the filling of bottles on a delivery wagon are prohibited.

About $2,000 is expended annually in the supervision of the milk supply. Two inspectors give all of their time to this work, and the city chemist a part of his time. During the last year 1,022 samples of milk were examined by lactometer; 64 by Babcock test and gravimetric analysis; bacteriological examination was made of 3 samples; and all of the herds within the city limits were twice inspected. A medical milk commission has exercised considerable influence toward the improvement of the city's milk supply by giving special encouragement to those interested in the production and sale of the highest grade of milk.

Among the recent improvements in the milk supply of the city the following is named: Better sanitary conditions where milk is produced and handled, including the practice of cleaning cans before they are returned to the dairy farms. Needed improvements, as given, include thorough inspection of all dairy farms sending milk into the city, the requirement that milk shall be cooled immediately after milking, refrigerator cars for shipment, and provision to protect milk from the heat when it is standing on the railroad platforms awaiting trains.

Rochester. (Population, 162,608.)

[For comparison with other cities in Class I, see p. 28.]

W. O. Marshall, meat and milk inspector.

Estimated average amount of milk used daily, 17,000 gallons, or 0.83 pint per capita, besides some skimmed milk and cream. The milk is distributed from 75 stores and 275 wagons. There seems to be little interest manifested in pasteurization. The retail price of milk is 5 cents per quart in summer and 6 cents in winter, the producer receiving one-half these amounts; skimmed milk is sold for 2½ cents per quart. The milk of 10 well-conducted dairies in the vicinity is sold for 6 cents per quart in summer and 8 cents in winter. Six herds, including 90 cows, are within the city limits, and milk is sent in from 200 dairy farms. Two-thirds of the total supply is shipped by rail, the farthest distance being 45 miles.

Ordinances Nos. 16, 17, and 18 (date?) refer to the milk supply. A license from the health department is required for the sale of milk, and its number must be shown wherever milk is sold. Its cost is $3 per year, and it is revocable for cause. Special care is required in the selection of persons licensed. Adulterated or unwholesome milk, milk from cows diseased or "confined for the most part" in stables, or fed on swill, brewery grains, distillery waste, or fermented food, or milk from cows fifteen days before or five days after calving, is forbidden. The milk standard is 12 per cent solids, 3 per cent fat. Skimmed milk is allowed if plainly labeled. Within the built-up portion of the city no one can keep more than 1 cow to a city lot 33 by 150 feet, and in the outlying portions of the city not more than 15 cows for each acre of land, except by special permission of the health department. Stables within the city must be kept clean, be well ventilated, and have 800 cubic feet of air space for each cow; the floor must be well drained; cows must be well bedded and kept clean; and every cow must be allowed to go out doors at least two hours every day..

Ordinance section regulating the number of cows to be kept in the city is given in Appendix I (p. 180).

The city expends annually about $4,000 for the supervision of the milk supply. Two officials—a milk inspector and chemist—give their entire time to this work. They examined during the past year 4,254 samples by lactometer and Babcock test; 204 samples by gravimetric analysis; and 335 samples for bacterial content; and inspected all of the herds in the city, and 175 of the 200 dairy farms. The average butter-fat content of samples examined in 1900 was 3.91 per cent. In a study of the dirt content of milk as shown by the number of bacteria, it was found there were relatively fewer bacteria in summer than in the cold season, the relation being 1:3.5. This is explained by the increased care necessarily given to milk in the warm weather to prevent its souring. In connection with some other work, the numbers of bacteria per cubic centimeter in 24 samples of milk are given; four times they exceeded 5,000,000 and in four samples they were fewer than 100,000, the lowest number being 15,000.

The most marked improvement recently made in the quality of the milk supply is due to increased cleanliness in its production. It is recommended that the use of swill feed be stopped; that milk be mixed so that all cans from one dairy will test alike; and that greater cleanliness be observed.

Syracuse. (Population, 108,374.)

[For comparison with other cities in Class I, see p. 28.]

F. E. Engelhardt, milk inspector and chemist.

The estimated average amount of milk used daily is 10,200 gallons, or 0.75 pint per capita, besides 800 gallons of skimmed milk and 250 gallons of cream. Milk is distributed from 340 stores and 195 wagons. While the practice of using glass bottles has greatly decreased during the past two years, there are yet about 2,500 in daily use, and these are filled on the farms and in one large milk-handling establishment in the city. About 200 gallons of milk is pasteurized daily, and its use is increasing. The retail price of milk is 5 cents per quart, and the producers are paid 2½ cents per quart throughout the year. About 40 dairies are said to be conducted in a satisfactory manner. Only 1 of them, however, which guarantees its milk to contain 4.5 per cent of fat, receives more than the market price; its milk is sold for 8 cents. There are 14 dairy herds in the city, including 176 cows; 217 dairies send milk into the city; only about 1 per cent is received by railway, the longest shipment being 8 miles.

Articles VI and XVII, sections 4, 19, and 20, and the special milk laws of the sanitary code of the department of health, 1901, refer to milk. The milk inspector must, twice a year, visit all farms producing milk for sale in the city and inspect cans, water supply, feeds, and the sanitary condition of stables. License fee for the sale of milk is $10(?). Before license is granted, persons sending milk to the city must file a certificate from a competent veterinarian, showing that his cows are free from disease. Impure or adulterated milk; milk from cows within five days after calving; milk from cows fed on unwholesome food, or milk with any added foreign substance, is prohibited. Persons working in a dairy shall not come in contact with persons having a contagious disease. Milk cans on milk wagons, used in retailing skimmed milk, sour milk, buttermilk, or "left" milk, shall be painted reddish brown. Permit must be obtained for the sale of bottled milk. No bottles shall be filled with milk except at a dairy, and all bottles must be properly sterilized before being again used. An ordinance has been passed requiring that all cows supplying the city with milk be submitted to the tuberculin test. The health officer, in a circular letter dated November 12, 1900, requires special care in the production and handling of milk; cleanly practices which should be observed in dairies are described.

The annual appropriation for the supervision of the city milk supply is $1,400; $300 of this is for laboratory expenses, and $1,100 is for the salary of one officer—the milk inspector and chemist. During the year 1902, 10,630 samples of milk were examined, all by lactometer, and doubtful cases by the Babcock test and gravimetric analysis, 120 analyses being made; 12 milk samples were found to be below the legal standard; 4 cans of milk were condemned and returned to the farms; 19 milk cans, 41 can covers, and 30 dippers were also condemned. All the dairy herds and farms furnishing the city with milk were inspected during the year, and 1 was put under quarantine; 3,410 cows on 200 farms were examined for tuberculosis, use being made of the tuberculin test; 20 were found to be diseased. A recent annual report of the milk inspector shows in detail the amount of work accomplished. It contains, also, much interesting information regarding the ways that milk becomes contaminated, and shows what methods should be followed to insure its purity. Such a report must be of much value in the hands of producers and dealers.

The milk association has done much to improve the supply and distribution of milk in this city. It has made it possible for the milk depots to have on hand at all times properly pasteurized and unpasteurized milk and cream, skimmed milk, buttermilk, cottage cheese, and fresh butter. These products are fresh and clean. Whenever outside peddlers are short of milk they are usually supplied by the association. The details of the work are conducted on hygienic principles.

Recent marked improvements in the milk supply are due to better care of the stables and greater cleanliness in handling milk. The need of rigid restrictions against the use of adulterants and the much-advertised preservatives is emphasized. A competent person should occasionally inspect the dairy farms and impart information as to the best methods of producing and handling milk.

Albany. (Population, 94,151.)

[For comparison with other cities in Class II, see p. 32.]

George L. Flanders, assistant State commissioner of agriculture.

The daily consumption of milk is estimated as 8,022 gallons, or an average of 0.68 pint per capita, besides 1,468 gallons of skimmed milk and 213 gallons of cream. Milk is sold from 105 stores and 188 wagons. Only a small part of the milk supply is delivered in glass bottles, and these are filled in the city. One firm pasteurizes milk, but this practice is not gaining in favor. The retail price of milk is 6 cents per quart throughout the year, producers receiving 3 cents. There are no "model dairies" in the vicinity. Within the city limits there are 25 herds, including from 4 to 40 cows each, or a total of 366 cows, and milk is sent in from 150 dairy farms. One-fourth of the total supply is received by railway, the longest shipment being 62 miles.

Rules and regulations adopted by the health department in March, 1897, supplement the State laws regarding the city milk supply. License for the sale of milk is issued free of charge. Cows must not be watered from wells in barnyards. Hands of milkers and milk utensils must be thoroughly cleaned. Milk shall not be handled by persons exposed to or suffering from a contagious disease. Bottles must not be filled in the street, in cars, at railroad stations, or in any place where dust may get into the milk. Nor can milk be stored or bottled in living rooms, except at the residence of customer.

The supervision of the city milk supply comes under State authority. During the past year 12,000 samples of milk were examined in the streets by the lactometer, and occasional samples were examined by the Babcock test and by gravimetric analysis; a few bacteriological examinations were made; farms are inspected when there is special cause showing that this is necessary.

The establishment of a milk commission is under consideration by the county medical society. The object of such a commission would be the encouragement of the production of pure milk. A member of the committee of the medical society inquiring into this subject is quoted as saying: "This is being done for our own protection, as we doctors are frequently asked what milk dealers we would recommend, and, without data of our own, our recommendation can be little more than a suggestion. It is the design of this committee to ascertain who sells the best milk and have that used by the families where we are called. In this way we believe the public will soon find out where the best milk can be obtained, and there will then be a general demand for it." The committee will point out to dairymen what improvements can be made and encourage such improvements.

Troy and Lansingburg. (Population, 73,246.)

[For comparison with other cities in Class II, see p. 32.]

The daily consumption of milk is estimated as 6,000 gallons, or an average of 0.66 pint per capita, besides 750 gallons of skimmed milk. Milk is sold from nearly all of the small grocery stores and also from 120 wagons. About 15 per cent of the retail trade is supplied in glass bottles, filled in the city. About 12 per cent of the milk is pasteurized, and this treatment is increasing in favor. The retail price of milk is 6 cents per quart throughout the year, the producer receiving 2¾ cents in summer and 3¼ cents in winter. There are no "model dairies" near the city. Milk is received from 200 dairy farms, 12 per cent coming by railway, the longest shipment being 50 miles.

State authorities supervise the milk supply. The need is felt of a closer examination of cows, farms, and water supply.

Utica. (Population, 56,383.)

[For comparison with other cities in Class II, see p. 32.]

Wallace Clarke, health officer.

George C. Hodges, chemist, New Hartford.

The daily consumption of milk is estimated as 5,000 gallons, or an average of 0.71 pint per capita, besides 300 gallons of skimmed milk and 150 gallons of cream. Milk is sold from 60 stores and 210 wagons. About one-fourth of the total supply is delivered in glass bottles, which are filled at the producing farms. No milk is pasteurized. The retail price of milk is 5 cents per quart in summer and 6 cents in winter, producers receiving 2 and 2½ cents summer and winter, respectively. There are 2 or 3 especially well-conducted dairies near the city, but their milk is not sold for an extra price. There are 5 herds, including 50 cows, within the city limits, and milk is brought to the city in wagons, from 125 dairy farms, the longest haul being 10 miles.

Board of health regulations Nos. 18, 19, 20, and 50 refer to milk. Persons selling milk must register with the city clerk. Adulterated, etc., milk or cream is prohibited. Milk cans in delivery wagons must be protected from the sun. Bottles must be filled only at the dairy or place of general supply. The milk standard is 12 per cent solids, 3 per cent fat. Regulation No. 50, consisting of 21 rules for the conduct of dairies, is printed on a heavy cardboard and must be posted in the barn, dairy, and place of business of each person selling milk or cream. Persons exposed to or suffering from a contagious disease must not handle the milk supply. Rooms where milk is kept must be properly located. Skimmed milk must be in a can or receptacle painted a distinct blue color.

About $600 is expended annually in the supervision of the milk supply, one inspector giving his entire time to this work. During the past year 50 samples of milk were examined by lactometer and Babcock test, suspected ones by gravimetric analysis; one bacteriological examination was made; all the city herds and all the dairy farms were inspected.

Yonkers. (Population, 47,931.)

[For comparison with other cities in Class III, see p. 36.]

Clark A. Sloan, milk inspector.

The daily consumption of milk is estimated as 4,000 gallons, or 0.67 pint per capita, besides 40 gallons of cream. No skimmed milk is sold. Milk is delivered from 208 stores and 56 wagons. About one-third of the milk retailed from wagons is delivered in glass bottles, filled mostly in the city. One firm pasteurized about 250 quarts daily during June, July, August, and September. The retail price of milk is 5 to 7 cents per quart in summer and 6 to 7 cents in winter, producers receiving 2½ to 3 cents in summer and 3 to 4 cents in winter. The milk from 3 "model dairies" near the city is sold for 8 to 10 cents per quart throughout the year. Within the city limits there are 28 herds, including 648 cows, and milk is sent in from 54 dairy farms. About one-half of the milk is received by railway, the longest shipment being 85 miles.

Board of health regulations, sections 48 to 61, and an amendment passed in April, 1900, refer to milk. Licenses for the sale of milk are granted free of charge. Adulterated, impure, etc., milk is prohibited. Brewers' grains may be fed if fresh. Bottled milk must not be delivered where there is a contagious disease, and bottles must be washed before being refilled. The milk standard is 12 per cent solids, 3 per cent fat. Skimmed milk must be labeled.

There is expended annually $2,500 in the supervision of the milk supply. One inspector, chemist, and bacteriologist gives his entire time to this work, and a veterinary inspector part of his time. During the past year 123 milk samples were analyzed gravimetrically; 43 were examined bacteriologically for puss cells and bacterial content; all the city herds and 6 of the 54 dairy farms were inspected.

The form for prohibiting and permitting the use of bottles is shown in Appendix IV (p. 209).

There has been a marked improvement in the character of the milk supply, due to an increase in the amount of milk delivered in bottles, and better sanitary conditions at dairy premises. It is proposed that stores be compelled to handle only bottled milk.

Binghamton. (Population, 39,647.)

[For comparison with other cities in Class III, see p. 36.]

William H. Abbott, secretary of the health department.

The daily consumption of milk is estimated as 2,520 gallons, or 0.51 pint per capita, besides 215 gallons of skimmed milk and 250 gallons of cream. Milk is sold from about 50 stores and 72 wagons. Fifty per cent of the milk is delivered in glass bottles, some filled at the farms and some in the city, and about 50 per cent is pasteurized, the practice increasing. The retail price of milk is 5 cents per quart throughout the year, the producers receiving 2 cents or less per quart in the summer season. The milk from a few specially well-conducted dairies is sold for 5 to 6 cents per quart. There are no dairy herds within the city limits. A small part of the milk from the dairy farms within a radius of 10 miles is brought to the city by trolley cars.

Ordinances prohibit the sale of impure milk.

There is no milk inspector and nothing is expended by the city in the supervision of its milk supply. The board of health takes action when complaints are received. During the past year certain individuals made bacteriological examinations of 6 samples of milk.

Elmira. (Population, 35,672.)

[For comparison with other cities in Class III, see p. 36.]

Jacob Miller, city meat and milk inspector.

The daily consumption of milk is estimated as 5,000 gallons, or 1.12 pints per capita. Milk is sold from 25 stores and 100 wagons. Glass bottles, some filled at the farms and some in the city, are used largely in the delivery of milk. The retail price of milk is 5 cents per quart throughout the year, producers receiving 2½ cents and 3 cents in the two seasons. Four dairies are conducted in an especially satisfactory manner, but their milk is not sold for an advanced price. Within the city limits there are 8 herds, including 170 cows, and milk is sent in from 150 dairy farms within 6 miles of the city.

One official gives a part of his time to the supervision of the milk supply. During the past year all of the dairies sending milk into the city were inspected; a number of milk samples were examined by lactometer; none were examined bacteriologically.

It is stated that dairies should be kept in a more sanitary condition, and more care should be taken as to the cleanliness of milk vessels.

A milk commission has recently been established for the purpose of encouraging the production and use of pure milk.

Schenectady. (Population, 31,682.)

[For comparison with other cities in Class III, see p. 36.]

William T. Clute, health officer.

The daily consumption of milk is estimated as 2,000 gallons, or 0.51 pint per capita. Milk is sold from 8 stores and 34 wagons. A small portion is delivered in glass bottles, some filled in the city and some at the farms. No milk is pasteurized; this treatment was tried but discontinued. The retail price is 5 cents per quart in summer and 6 cents in winter, producers receiving 2½ and 3 cents in the two seasons. There are no "model dairies" near the city. Within the city limits there are 3 herds, including 20 cows. About 260 gallons of milk is received daily by railway, the longest shipment being 18 miles.

Only a small amount is expended by the city in the supervision of the milk supply. During the past year 500 samples of milk were examined by the lactometer; no bacteriological examinations were made; none of the city herds or dairy farms were inspected.

There has been a recent improvement in the composition of the milk supply. The inspector recommends that the sanitary conditions of dairies be placed under the supervision of the board of health.

Auburn. (Population, 30,345.)

[For comparison with other cities in Class III, see p. 36.]

R. A. Dyer, acting milk inspector.

The daily consumption of milk is estimated as 3,000 gallons, or 0.79 pint per capita, besides 50 gallons of skimmed milk and 50 gallons of cream. Milk is sold from 4 stores and 60 wagons, and about 10 per cent of it is delivered in glass bottles, which are filled at the farms. Sixty gallons of milk is pasteurized daily, and the milk thus treated is increasing in favor. The retail price is 5 cents per quart throughout the year, the producers receiving 2½ cents. Within the city limits there are 5 herds, including 230 cows, and milk is sent in from 50 dairy farms, all within a radius of 6 miles.

City ordinances regulate the milk supply. The milk inspector must inspect all places where milk is produced or sold. Cow stables must be well constructed, kept clean, and cows must be given pure water. Adulterated, etc., milk and milk produced or handled where there is a contagious disease is prohibited.

During the past year 450 samples of milk were examined for cream volume, and 160 by the Babcock test; no bacteriological examinations were made. In 1899, 421 cream tests were made, showing an average of 17.5 per cent of cream by volume; 204 fat tests were made by the Babcock machine with an average of 4.2 per cent fat; 18 of the 50 dairy farms were visited.

The inspector suggests that the milk supply might be improved if dairy farms were inspected under the direction of the State department of agriculture, which has facilities for making bacteriological as well as chemical examinations of milk.

Watertown. (Population, 21,696.)

[For comparison with other cities in Class IV, see p. 40.]

Thomas Burns, veterinary surgeon.

The daily consumption of milk is estimated as 2,400 gallons, or 0.88 pint per capita, besides 750 gallons of skimmed milk and 150 gallons of cream. Milk is sold from 15 stores and 40 wagons. Seven per cent of it is delivered in glass bottles, filled both in the city and at the farms. A small quantity is pasteurized, and the practice is increasing. The retail price of milk is 5 cents per quart throughout the year, producers receiving 2½ cents. Within the city there are "14 herds, including 18 cows," and milk is brought in wagons from 37 dairy farms, the longest haul being 7 miles.

There is expended annually $750 in the supervision of the milk supply, two officials giving a part of their time to this work. During the past year 850 samples were examined by lactometer, Babcock test, and gravimetric analysis. No bacteriological examinations were made. All the city herds and all the dairy farms were inspected. An effort is being made to induce all dairymen to adopt the tuberculin test.

Recent improvement in the supply is due to better dairy rations and better methods for the care and delivery of milk.

Mount Vernon. (Population, 21,228.)

[For comparison with other cities in Class IV, see p. 40.]

N. Eugene Smith, M. D., health officer.

The daily consumption of milk is estimated as 3,000 gallons, or 1.18 pints per capita, besides 350 gallons of cream. In explanation of the large consumption of milk, it is stated that large amounts are used in institutions the inmates of which are not numbered in the population of the city. No skimmed milk is sold. Milk is sold from 15 stores and 60 wagons. Nearly one-third of it is delivered in glass bottles, and these are filled at the receiving stations and by local dealers. A small amount is pasteurized; and this practice is increasing. The retail price is 7 to 15 cents per quart in summer, and 8 to 15 cents in winter, producers receiving 1¼ to 2 cents in summer and 3 cents in winter. The milk from 4 "model dairies" is sold for 8 to 15 cents per quart throughout the year. Within the city limits there are 10 herds, including 100 cows, and milk is sent in from 90 dairy farms. One-third of the total supply is received by railway, the longest shipment being 75 miles.

The sanitary code of health, 1893, sections 86 to 96, refer to milk. License fee for the sale of milk is $1. Adulterated, etc., milk is prohibited. The milk standard is

12 per cent solids, 3 per cent fat, and specific gravity not less than 1.029. Cans and wagons from which skimmed milk is sold must be labeled. Milk-delivery wagons must be covered during the months of June, July, and August. Cows must not be fed on garbage, swill, etc. Stores must post in a conspicuous place the names of persons furnishing milk.

There is expended annually $500 in the supervision of the milk supply. During the past year 40 samples of milk were examined by lactometer, Babcock test, and gravimetric analysis; 275 bacteriological examinations were made for typhoid bacilli, etc.; all the city herds and all the dairy farms were inspected.

Recently there has been an improvement in the quality of the milk supply. Further improvement would result if inspections were more frequent and if licenses were revoked wherever the milk is not being properly produced or handled.

Lockport. (Population, 16,581.)

[For comparison with other cities in Class IV, see p. 40.]

C. A. Warren, agent of the New York State department of agriculture.

The daily consumption of milk is estimated as 900 gallons, or an average of 0.43 pint per capita, besides 25 gallons of skimmed milk and 20 gallons of cream. Milk is sold from 30 stores and 24 wagons. About 10 per cent of it is delivered in glass bottles filled both in the city and at the farms; none is pasteurized. The retail price is 5 cents per quart in summer and 6 cents in winter, producers receiving 2½ cents and 3 cents in the two seasons. There are no "model dairies" near the city. Within the city limits there are 2 herds, including 14 cows, and milk is brought in wagons from 22 dairy farms, the longest haul being 6 miles.

An ordinance adopted January, 1887, refers to milk. License fee for the sale of milk is $1 to $10 for each person selling from wagons, the amount in each case to be fixed by the mayor, and $1 for each person selling from a store or shop or peddling it in a small way.

The milk supply is under the supervision of State authorities, the city appropriating nothing for this work. During the past year about 1,000 samples of milk were examined by lactometer; 40 samples by the Babcock test; no bacteriological examinations were made; the city herds and 12 of the 22 dairy farms were inspected.

Rome. (Population, 15,343.)

[For comparison with other cities in Class IV, see p. 40.]

J. M. Currie, V. S., meat and milk inspector.

The daily consumption of milk is estimated as 1,000 gallons, or 0.52 pint per capita. Milk is sold from 4 stores and 26 wagons. About one-fourth of it is delivered in glass bottles, filled usually at the farms; none is pasteurized. The retail price is 4 cents per quart in summer and 5 cents in winter, producers receiving 2 cents and 2½ cents in the two seasons. There are no "model dairies" near the city. Within the city limits there are 3 herds, including 65 cows, and milk is sent in from 36 dairy farms within a radius of 6 miles.

The meat and milk inspector (salary $800) gives about one-half of his time to the supervision of the milk supply. During the past year 106 samples were examined by lactometer and Babcock test. All the city herds and dairy farms were inspected.

Recent improvement is due to cleaner barns, better cattle foods, and more sanitary methods of milking. It is recommended that milk dealers be required to obtain licenses, and that coupon tickets employed in making regular retail sales be destroyed after being used once.

NORTH CAROLINA.

Public laws of 1899, chapter 86, refers to foods. It is unlawful to sell adulterated food, which is defined at length. The board of agriculture shall examine samples of food and may publish results. Solicitors shall prosecute for violations reported by the commissioner of agriculture.

NORTH DAKOTA.

E. E. Kaufman, assistant dairy and food commissioner, Fargo.

Laws of 1899, chapter 72, refers to milk. The enforcement of this law is charged to the assistant State dairy and food commissioner. Persons selling from vehicles milk from more than 4 cows in any city or town of 1,000 or more inhabitants must obtain license from the assistant commissioner. License fee is $1 annually, and all licenses expire in June. Certain information must be furnished, and changes of employees must be reported. Vehicles shall be marked with license number and name and place of business of owner. License is necessary also for selling milk from a store or stand; fee $1. It is unlawful to sell milk that is adulterated, unwholesome, etc.; milk from an animal diseased or having ulcers, etc.; milk from a cow within fifteen days before and five days after parturition; milk from cows kept in an unhealthy manner, or cream from any such milk. Skimmed milk shall be sold only for what it is. The milk standard is 12 per cent solids, 3 per cent fat; the cream standard is 15 per cent fat.

In the year 1900 the assistant dairy commissioner issued 35 licenses for the sale of milk in 9 cities and towns. Funds not being available, no systematic inspection was made, and as no complaints were received no samples of milk were taken for examination. The dairies supplying milk to three or four cities were inspected. In cities where licenses have been taken out, it is estimated that 650 cows supply milk to 1,950 private families, 40 hotels, 30 restaurants and lunch counters, 30 boarding houses, and 20 soda fountains; the average amount of milk required per month is 25,000 gallons, cream 50 gallons, and skimmed milk 1,900 gallons.

The form for report upon inspection of dairies and herds is shown in Appendix IV (p. 196).

OHIO.

Joseph E. Blackburn, State dairy and food commissioner, Columbus.

Ohio Laws of 1889, volume 86, page 229; and 1886, volume 83, page 120, amended, and page 178, sections 9 to 13, refer to milk, etc. The enforcement of laws relating to foods and drinks is charged to the State dairy and food commissioner. It is unlawful to sell milk to which water or any foreign substance has been added, or milk from diseased cows. The milk standard is 12 per cent solids, 3 per cent fat, except in May and June, when it is 11½ per cent solids. Skimmed milk may be sold from cans plainly labeled. Cows producing market milk shall not be kept in a cramped or unhealthy condition or fed upon food that will produce unwholesome milk. Condensed milk shall be made from pure unskimmed milk, and be plainly labeled, etc.

Ohio Laws of 1884—volume 81, page 67, amended, refers to foods. It forbids the sale of any food that is adulterated, which term is defined at length.

The annual report of the dairy and food commissioner shows that during the past year 22 samples of milk were examined under his direction; 11 of these were from Canton and the remainder from 8 other towns. Only 3 of the samples contained more than 12 per cent total solids, most of them being badly adulterated.

Cleveland. (Population, 381,768.)

[For comparison with other cities in Class I, see p. 28.]

Charles H. Stone, jr., inspector of food.

The average daily consumption of milk is estimated as 21,490 gallons, or 0.45 pint per capita, besides 1,000 gallons of skimmed milk and 500 gallons of cream. Milk is sold from 1,200 stores and 580 wagons. About one-third the total supply is delivered in glass bottles, and these are filled in the city. Very little milk is pasteurized, but there seems to be a growing demand for it. The retail price of milk is 5 cents per quart in summer and 6 cents in winter. There are 2 well-conducted dairies near the city which sell their product for 6 cents per quart in summer and 7 cents in the winter. Within the city limits there are 31 dairy herds, including 225 cows. Milk is sent in from 650 dairy farms, the longest shipment being 65 miles.

There is no reference to a milk ordinance in the special report of the food inspector upon the city milk supply.

The city expends in the supervision of its food supply about $3,000 annually, one food inspector, two assistants, and one sanitary officer giving their entire time to this work. It is impossible to state what portion of the expenditure is in the interest of the milk supply. During the year 6,666 samples of milk were examined by the Babcock test; 300 samples for pathogenic bacteria; and all the city milch cows and 250 of the 650 dairy farms were inspected.

Recent improvements are due to better stabling facilities for milch cows and to more careful handling of the milk. A better knowledge of the care of milk is needed alike by the producer, peddler, and consumer.

Cincinnati. (Population, 325,902.)

[For comparison with other cities in Class I, see p. 28.]

J. Stewart Hagen, M. D., milk inspector.

The daily consumption of milk is estimated as 25,000 gallons, or 0.61 pint per capita. It is said that about half of the milk supply of the city is controlled by one large concern. Milk is sold from about 200 stores and 200 wagons. Glass jars are used only by 3 or 4 milk dealers; they are filled in the city. Milk is pasteurized by two or three concerns and the practice is increasing. The retail price of milk throughout the year is 6 cents per quart, producers being paid half as much. The product of 3 especially well-conducted dairies near the city is sold for 8 cents per quart. Within the city limits there are about 40 dairy herds, including 1,400 head. About 200 dairy farms send milk into the city. Appoximately 25 per cent of the milk supply is shipped by railway, the most distant point of supply being 100 miles away.

No milk ordinance for Cincinnati has been seen, but the milk inspector reports the milk standard to be 12 per cent solids, 3.1 per cent fat.

The annual expenditure for the supervision of the city milk supply is about $1,200. One officer, as dairy and milk inspector, devotes his entire time to the duties of the office. During the year 600 samples were examined by the Babcock test; no bacteriological examinations were made; all the herds in the city and 150 of the 200 dairy farms were inspected.

The milk supply has recently shown a little improvement on account of the increase of the portion that is produced in the country. There should be a rigid inspection for milk containing preservatives, and dairies within the city should be moved to districts where pasturage is available.

Toledo. (Population, 131,822.)

[For comparison with other cities in Class I, see p. 28.]

William H. Schurtz, meat and milk inspector.

The daily consumption of milk is estimated as 9,650 gallons, or 0.59 pint per capita. Milk is sold from 221 stores and 253 wagons. Glass bottles are used in the delivery of milk, some of them being filled in the country and others in the city. The practice of pasteurizing milk is new and is increasing rapidly. The retail price of milk is 5 cents per quart in summer and 6 cents in winter, and the producer on the farm realizes 3 cents per quart in summer and 4 cents in winter. There is 1 so-called "model dairy" in this locality, whose product sells at 8 cents per quart in summer and 10 cents in winter. Within the city there are 41 dairy herds, including 769 cows, and milk is sent into the city from 202 dairy farms. About one-third of the total milk supply is received by railway, the longest shipment being 80 miles.

An ordinance of 26 sections, passed in November, 1900, regulates the sale of milk and cream. A permit to sell milk or cream must be obtained from the board of police commissioners. One dollar must be paid for each conveyance, and each must show permit number and name of dealer. Permits expire the first of the year and are revocable for cause. When application for one is made, certain information regarding the source of the milk supply, wagons to be used in delivery, etc., must be filed. Permit will not be issued until authorities are satisfied, after inspection, with the sanitary conditions of the producing dairies, but while the matter is being considered the applicant may carry on his business. The milk inspector must examine for tuberculosis and other diseases all cows supplying milk for city trade which are in Lucas County, those outside of the county to be examined by some local persons acceptable to the board of health. The tuberculin test may be used. All animals shall be tagged to show results of their examination. Dairy premises must be kept reasonably clean. Names of dairymen supplying milk must be posted in stores. The milk standard is 12 per cent solids, 3 per cent fat, except in May and June, when it is 11½ per cent solids. Skimmed milk may be sold if in vessels plainly labeled and from delivery wagons properly marked. The use of preservatives is prohibited. Filthy milk, milk or cream from diseased cows or cows fed on slops, milk produced in a place where a contagious disease exists, or handled by a person recently so exposed, is prohibited, and may be confiscated if offered for sale.

About $1,250 is expended annually in the supervision of the city milk supply, and one inspector gives his entire time to this work. During the year 450 samples of milk were examined by gravimetric analysis; there were 43 prosecutions and 42 convictions of persons selling milk and cream adulterated by preservatives and otherwise; 14 bacteriological examinations were made of milk from cows having tuberculosis, actinomycosis, and cow pox; all of the herds within the city and 131 of the 202 dairy farms sending milk into the city were inspected. In the preceding year 106 dairies were inspected and 293 of the 2,914 cows were found to be unfit for producing milk.

There has recently been a decrease in the sale of adulterated, skimmed, or preserved milk. Government inspectors should have supervision of dairies producing market milk.

The application for permit to sell milk, upon the back of which the milk ordinance is printed, calls for the following information: Name of applicant and residence; location of dairy or dairies from which applicant obtains his milk and name of owner of such dairy or dairies; number of cows in dairy from which applicant obtains his milk; manner of disposing of milk.

Columbus. (Population, 125,560.)

[For comparison with other cities in Class I, see p. 28.]

W. D. Deuschle, M. D., superintendent of the division of health.

The daily consumption of milk is estimated as 6,397 gallons, or 0.41 pint per capita. The amounts of skimmed milk and cream are not known. Milk is sold from 134 stores and 286 wagons. Glass bottles filled at the producing farms are used quite extensively in the delivery of milk. The practice of pasteurizing is just beginning and is growing in favor. The retail price of milk is 6 cents and the wholesale 4 cents per quart throughout the year. There are several dairies near the city conducted on a better plan than others, but their milk is not sold at an extra price. There are only a few milch cows kept within the city limits, the greater part of the milk supply coming from 191 dairy farms. Only a small portion of the milk supply is shipped into the city by rail, the longest shipment being 40 miles.

Sections 109, 114–118, 120 (amended), and 133 of ordinance No. 6169 refer to the milk supply. A permit to sell milk must be obtained from the board of health. It is issued free and on condition that only pure milk will be handled. Permit number and location of dairy must be shown on wagons, and names of dairymen supplying milk must be posted in stores. The sale of adulterated milk—milk from diseased cows or cows fed upon swill, etc.—is prohibited. The milk standard is 12 per cent solids, 3 per cent fat, except in May and June, when it is 11 per cent solids, 2.5 per cent fat. Milk below the standard, including skimmed milk, may be sold if plainly marked. Cows in the city must be kept in buildings having good floors, and from April to September they must not be confined any other time than from 6 p. m. to 6 a. m. City cow stables must be thoroughly cleaned daily from April to October, and twice a week from November to March, and stables yards must be kept clean.

About $1,200 is expended annually in the supervision of the milk supply. One milk inspector and one bacteriologist give their entire time to this work. During the past year 456 samples of milk were examined by lactometer and the Babcock test, and a few examinations were made for typhoid and tubercle bacilli. No inspection of the few herds in the city or of the dairy farms is reported. (Seventy-eight herds were inspected the year previous.)

Recent marked improvements have been shown in the purity and quality of the milk. Suggested improvements include the inspection by a competent veterinarian of all herds for tuberculosis, the licensing of all milk dealers, the more frequent sanitary inspection of dairies, and more chemical and bacteriological examinations of milk.

Dayton. (Population, 85,333.)

[For comparison with other cities in Class II, see p. 32.]

Nelson Emmons, sr., clerk of the board of health.

The daily consumption of milk is estimated as 6,500 gallons, or an average of 0.61 pint per capita, besides 200 gallons of skimmed milk and 150 gallons of cream. Milk is sold from about 300 stores and 100 wagons. A large amount of the milk supply is delivered in glass bottles which are filled at the farms. Little or no milk is pasteurized. The retail price is 5 to 6 cents per quart throughout the year, the producers receiving 3¾ cents. The milk from 3 especially well-conducted dairies near the city is sold for 7 cents per quart. There are 194 milch cows, in 15 herds, within the city limits. Fifty dairy farms send in milk; about one-half is received by railway (steam and electric), the longest shipment being 20 miles.

The city has no milk ordinance.

No appropriation is made by the city for the supervision of its milk supply. The sanitary police and meat inspector has given a part of his time to the work. During the past year 5 milk samples were examined for preservatives; all the city herds and 37 of the 50 dairy farms were inspected.

It is proposed that the city should have a veterinary surgeon as a dairy inspector, and an ordinance requiring milk dealers to be licensed.

Youngstown. (Population, 44,885.)

[For comparison with other cities in Class III, see p. 36.]

W. A. Banks, food inspector.

Estimated daily consumption of milk is 2,000 gallons, or 0.36 pint per capita. Milk is sold from 45 stores and 60 wagons. Two-thirds of it is delivered in glass bottles filled at the producing farms. A small quantity of milk is pasteurized; this practice is increasing. Milk is retailed at 6 cents per quart in summer and 8 cents in winter, producers receiving 3 and 4 cents in the two seasons. There are a few specially well-conducted dairies near the city, but they do not receive an extra price for their milk. There are no dairy herds within the city limits. Forty dairy farms send in milk. Only a small portion is received by railway, the longest shipment being 15 miles.

About $100 is expended annually in the supervision of the milk supply, the food inspector giving a part of his time to this work. During the past year 109 samples of milk were examined by the centrifugal method; 12 bacteriological examinations were made; no farms were inspected. It is said that formaldehyde is used extensively during the hot weather to prevent souring.

A needed improvement is the licensing of all milk dealers.

Akron. (Population, 42,728.)

[For comparison with other cities in Class III, see p. 36.]

M. W. Hoye, milk inspector.

The daily consumption of milk is estimated as 3,000 gallons, or 0.56 pint per capita, besides 100 gallons of cream. Milk is sold from 75 stores and 88 wagons. One-sixth of the total supply is delivered in glass bottles, most of which are filled at the farms. No milk is pasteurized. Milk is retailed at 5 cents per quart in summer and 6 cents in winter. There are no "model dairies" near the city. Within the city limits there are 2 herds, including 25 cows, and milk is sent in from 60 dairy farms. Four hundred gallons of milk is received by railway daily, the longest shipment being 20 miles.

There is expended annually $300 in the supervision of the milk supply, one official giving a part of his time to this work. During the past year 580 samples were examined by lactometer and lactoscope; no bacteriological examinations were made; the city herds and 54 of the 60 dairy farms were inspected.

Springfield. (Population, 38,253.)

[For comparison with other cities in Class III, see p. 36.]

Henry H. Seys, M. D., health officer.

This city has no milk ordinance, and there is no inspection of the milk supply. Milk is sold for 5 to 6 cents per quart throughout the year. Two dairies, better conducted than others, receive 6 cents per quart for their product. The longest distance milk is sent to the city is 8 miles.

Canton. (Population, 30,667.)

[For comparison with other cities in Class III, see p. 36.]

James Sell, milk inspector.

The daily consumption of milk is estimated as 2,000 gallons, or 0.52 pint per capita. Milk is sold from 70 wagons. About 10 per cent of the milk is delivered in glass bottles, filled mostly at the farms. One firm pasteurizes milk, and the practice is increasing very slowly. The retail price of milk is 5 cents per quart throughout the year, producers receiving 3 cents. Within the city limits there are 3 herds, including 41 cows, and milk is sent in from dairy farms within a radius of 10 miles.

State laws supplemented by board of health rules govern the sale of milk. Persons selling milk must have a permit.

There is expended annually $700 by the city in the supervision of its milk supply, two officials—a food and dairy inspector and a milk inspector—giving a part of their time to this work. During the past year milk samples were examined by the lactometer. The city herds and all the dairy farms were inspected.

Hamilton. (Population, 23,914.)

[For comparison with other cities in Class IV, see p. 42.]

A. L. Smedley, M. D , health officer.

The daily consumption of milk is estimated as 1,027 gallons, or 0.34 pint per capita. Milk is sold from 46 stores and 32 wagons. About 3.5 per cent is delivered in glass bottles, half of these being filled at the farms, the rest in the city. About 5 per cent of the total supply is pasteurized; the practice is not increasing. The retail price is 6 cents per quart throughout the year. There are no "model dairies" near the city. Within the city there are 21 herds, including 73 cows, and milk is brought in wagons from 26 dairy farms, the longest haul being 6 miles.

The health department, with an appropriation of $1,500 for all its work, has supervision over the milk supply. During the past year 162 samples of milk were examined by the lactometer and Babcock test, and by chemical tests for preservatives; two examinations were made for tubercle bacilli; 13 city herds and 16 of the 26 dairy farms were inspected.

Recent improvement in the milk supply is due to the decreased use of preservatives. It is recommended that the sale of milk in butcher shops be prohibited; that milk in grocery stores be kept in separate refrigerating boxes; and that no cows be kept within the city limits.

Warren. (Population, 8,529.)

[For comparison with other cities in Class IV, see pp. 42.]

Thomas B. Webb, sanitary policeman and food inspector.

The daily consumption of milk is estimated as 645 gallons, or 0.60 pint per capita, besides 20 gallons of skimmed milk and 20 gallons of cream. Milk is sold from 1 store and 11 wagons. About 30 per cent of the milk is delivered in glass bottles, half of these being filled in the city and the rest at the farms; none is pasteurized. The retail price is 5 cents per quart throughout the year, producers receiving 2½ to 3 cents in summer and 3 cents in winter. The milk from 5 dairies, conducted in a better manner than others, is sold at the regular price. Within the city limits there is 1 herd (24 cows), and milk is received from 16 dairy farms. In summer about 3 per cent is shipped by railway, the longest shipment being 15 miles.

Secs. Nos. 66 to 72 of the sanitary code of January, 1896, refer to milk. Milk license fee is 50 cents, but persons having only 1 cow are exempt. Impure, adulterated, etc., milk is prohibited. Skimmed milk must be labeled. Milk must be from cows inspected and found to be healthy.

Nothing is appropriated by the city for the supervision of its milk supply. The dairies pay for the inspection. During the past year 123 samples of milk were examined by the Babcock test; 2 samples were tested for preservatives; no bacteriological examinations were made; the city herd and the dairy farms were inspected.

Recent improvement is due to better food and water supply of dairies, ventilation, and cleanliness of stables, the semiannual inspection of dairies, and the publication in the daily papers of the monthly fat tests.

Fostoria. (Population, 7,730.)

[For comparison with other cities in Class IV, see p. 42.]

E. A. Schubert, milk inspector.

The daily consumption of milk is estimated as 400 gallons, or 0.41 pint per capita, besides 25 gallons of skimmed milk and 10 gallons of cream. Milk is sold from 10 stores and 8 wagons. A small portion of it is delivered in glass bottles, and these are filled at the farms. Some milk is pasteurized, and the practice is increasing. The retail price is 5 cents per quart in summer and 6 cents in winter, producers receiving 3 and 3½ cents in the two seasons. The milk from 2 well-conducted dairies is sold for 6 cents in summer and 7 cents in winter. Within the city limits there is "1 herd, including 125 cows," and milk is brought in wagons from 6 dairy farms, the longest haul being 3 miles.

There is expended annually $200 in the supervision of the milk supply, one official giving a part of his time to this work. During the past year 108 samples were examined by lactometer, Babcock test, and gravimetric analysis; 3 bacteriological examinations were made; all the city cows and all the dairy farms were inspected.

Recent improvement in the milk supply is due to better feed and to the introduction of a better grade of cattle.

OKLAHOMA.

Compiled statutes of 1893, chapter 25, article 36, section 16, and article 50, sections 1, 2, and 8, and chapter 8, section 4, refer to milk, foods, etc. The board of health shall destroy any impure article of food offered for sale. Milk from a "cow not in proper condition of health," or any milk adulterated by water or a deleterious substance, or colored, shall not be sold or delivered. The adulteration of food or drink with fraudulent intent is a misdemeanor. The buyer shall be informed if provisions are diseased or unwholesome.

OREGON.

J. W. Bailey, State dairy and food commissioner, Portland.

An act approved February 27, 1901, refers to milk, foods, etc., and its enforcement is charged to the State dairy and food commissioner. The chemist of the State agricultural college shall assist by making analyses. Justices' courts have concurrent jurisdiction. The dairy and food commissioner shall inspect dairy herds, methods of feeding, etc., as often as possible. The dairy and food commissioner shall keep a list of all persons selling milk or cream in cities of 10,000 or more inhabitants. Such persons shall secure from the commissioner a metal plate giving name, etc., for attachment to each wagon, and shall report changes of management or location. The State veterinarian shall be notified of diseased cows. Owners must give proper attention to dairies found in a filthy or unhealthy condition, when so directed by the commissioner. Milch cows in stables shall be allowed 800 cubic feet of air space each; when facing each other, shall not be closer than 10 feet. Stables shall be well ventilated and kept in a healthful condition. It is unlawful to sell any unclean, diseased, or unwholesome food or drink. The sale of milk from cows within fifteen days before and five days after parturition, or from cows fed on unwholesome food, is forbidden. The use of certain preservatives in milk or cream is prohibited. No adulterated food or drink shall be sold unless plainly marked to show its true character. Such articles are defined in detail, and include milk having less than 12 per cent solids or 3 per cent fat or 9 per cent solids not fat, or showing less than 1.038 specific gravity after the removal of the cream. Manure must not be allowed to accumulate within 150 feet of any barn where dairy cows are stabled.

Portland. (Population, 90,426.)

[For comparison with other cities in Class II, see p. 32.]

J. W. Bailey, State dairy and food commissioner.

The daily consumption of milk is estimated as 7,500 gallons, or an average of 0.66 pint per capita. Milk is sold from 25 stores and 150 wagons. Only a very small portion of the milk supply is delivered in bottles, and these are filled in the city. Little or no milk is pasteurized. The retail price is 5 cents per quart in summer and 5 to 7½ cents in winter, producers receiving 2½ cents in summer and 2½ to 3 cents in winter. There are no "model dairies" near the city. Within the city limits there are 45 herds, including 240 cows, and milk is brought in wagons from dairy farms within a radius of 8 miles.

The city has no milk ordinance, the milk supply being regulated by State laws.

The city makes no appropriation for the supervision of its milk supply. The little work accomplished along this line is done by the State dairy and food commission. During the past year 75 milk samples were examined by the Babcock test and by gravimetric analysis; no bacteriological examinations were made; 20 of the 45 city herds and 15 dairy farms were inspected.

The commissioner believes that the daily press, by arousing an interest in the subject, might bring about a much needed improvement in the milk supply.

PENNSYLVANIA.

John Hamilton, secretary of agriculture, Harrisburg.

Session of 1895, No. 258; 1893, No. 96; 1885, No. 186; 1878, No. 183; and 1869, No. 56, refer to milk, etc. The dairy and food commissioner is charged with the enforcement of laws concerning dairy products. The councils of cities and boroughs are authorized to provide for milk inspection. Persons peddling milk in cities or villages of over 1,000 inhabitants must have the vehicle marked with name of owner and locality where milk is produced. No person shall knowingly sell adulterated or unwholesome milk. The addition of ice to milk is declared an adulteration, and milk from animals fed on distillery waste, etc., is declared to be impure. The sale, in cities of the second and third classes, of milk to which water or any other foreign substance has been added, or milk from diseased cows (or goats) or cows fed on any putrefying substance is forbidden. In such cities the milk standard is 12.5 per cent solids, 3 per cent fat, specific gravity at 60° F. between 1.029 and 1.033; and skimmed milk may be sold if plainly marked, its standard being 6 per cent cream by volume, 2.5 per cent fat, specific gravity at 60° F. between 1.032 and 1.037. It is the duty of bureaus of health in cities of the second and third classes to register all dairies and milk depots and to require owners' names to be placed upon vehicles delivering milk, and to prevent the sale of adulterated milk.

Session of 1895, No. 233, refers to foods. It forbids the sale of food that is adulterated, which term is defined at length.

Although the supervision of the milk supply of cities is largely under local boards of health, some work along this line has been accomplished by the State department of agriculture.

A bacteriological examination of the milk supply of several cities was made in 1897 and reported upon in the annual report of the department. A recent report of the dairy and food commissioner shows that in 6 months 287 samples of milk from 18 cities and towns and 4 samples of cream from 2 cities were examined. One hundred and ninety-seven of the milk samples and 3 of the cream samples were found to be of good composition; 25 milk samples were skimmed, 32 watered, 42 preserved, and 3 colored. In the majority of cases the milk samples were taken from peddlers or milk depots.

Philadelphia. (Population, 1,293,697.)

[For comparison with other cities in Class I, see p. 28.]

William J. Byrnes, chief inspector of milk.

It is estimated that 75,000 gallons of milk are used daily, or an average of 0.46 pint per capita. Little skimmed milk is used. Milk is sold in about 1,500 stores and served from about 2,000 wagons. A large number of glass jars are used in the retail trade, most of them being filled in the city. Only a small part of the milk is pasteurized. The retail price of milk in the summer and winter is 6 and 8 cents per quart, respectively. Farmers are paid for their milk,[a] delivered in the city, 2½ to 3 cents per quart[b] in the summer period, and 3½ to 4 cents in the winter. The two periods vary in length in different years; for instance, in 1901 the summer period extended over only three months. A few first-class dairies are in the vicinity of Philadelphia and their milk brings an extra price. About 500 herds, including 5,000 cows, are within the city limits. Milk is sent into the city from about 2,500 dairy farms; almost all of it comes by rail, the most distant point of supply being 200 miles away. A large portion of the milk supply is received from the adjoining States—New York, New Jersey, Maryland, and Delaware.

The few State laws which apply to the milk supply of Philadelphia are supplemented by an ordinance of 10 sections, approved September 23, 1890. This prohibits the sale of adulterated or impure milk, including the product of animals kept in a crowded or unhealthy condition, or fed on distillery waste usually called "swill," or any substance in a state of putrefaction or of an unwholesome nature; and milk which has been exposed to the emanations of a person sick with a contagious disease, and milk from tuberculous cows. The milk standard is 12 per cent milk solids and 8.5 per cent solids not fat. Skimmed milk may be sold if its container is plainly labeled. It must contain at least 8.5 per cent of milk solids, exclusive of fat. (By a supreme court decision, there is no legal distinction between partially and wholly or separator-skimmed milk.) The director of the department of public safety is required to appoint an inspector of milk and the necessary assistants, analysts, clerks, and collectors of samples for the enforcement of this ordinance through the board of health. The officers are given authority to examine suspected milk wherever found, and, if their test shows it to be adulterated, to pour it out or return it to the consignor. Samples must be taken in duplicate. The inspector shall each month publish, in such city newspapers as are willing to give space, a full list of all whose milk was tested the previous month and the results of the analyses, with notes, to show the extent of deficiency of samples below standard.

The last section of the ordinance states that no person shall be liable for violation

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[a] The monthly prices, from 1899 to 1901, received by shippers per quart for milk delivered in the city, freight prepaid, as announced by the Philadelphia Milk Exchange and reported by The Milk Reporter, are as follows:

Month.	1899.	1900.	1901.	Month.	1899.	1900.	1901.
January	3½	4	3½	July	3	3½	3
February	3½	3½	3½	August	3	3½	3
March	3½	3½	3½	September	3½	3½	4
April	3½	3½	3½	October	3½	3½	4
May	2½	3½	3½	November	4	4	4
June	2½	3½	3	December	4	4	4

[b] In wholesale transactions the "dry" quart is used.

if he shows to the satisfaction of the magistrate or court that he could not have ascertained that the milk was impure, etc.

The amount expended by the city in the supervision of the milk supply the past year was $9,580. Ten officials, including a chief milk inspector, assistant inspectors, and collectors of samples, give their entire time to this work. During the year 47,023 samples were tested by the lactometer, and 95 samples were analyzed to obtain evidence for prosecutions. The lactometer samples represented 1,684,768 quarts, of which 21,384, or 1.25 per cent, were condemned for adulteration with water, 267 for being skimmed, 480 for containing formaldehyde, and 4 for containing coloring matter (annatto). Practically half of the condemnations were upon the railroad receiving platforms, and in such cases, the shippers being beyond the jurisdiction of the inspector, the condemned milk was reshipped with a certificate of condemnation, and the dealer accustomed to handle the product of the dairy was warned not to receive later shipments unless free from adulteration. The percentages of milk examined that was condemned in each month of the year were as follows:

January	1.73	May	0.95	September	1.02
February	1.03	June	1.82	October	1.10
March	1.36	July	1.88	November	.61
April	1.51	August	1.75	December	.12

It is claimed, on the basis of many analyses, that the entire city milk supply will average over 13 per cent total solids and over 4 per cent fat. During the year 390 samples were examined for pus cells, pathogenic germs, etc.; these included numerous samples of milk obtained from houses where there were typhoid fever cases, which were examined with negative results. During the year all the dairies within the city limits were inspected; nothing is known of the conditions obtaining on many of the supplying farms which are beyond the city limits. The successful work of the milk commission of the Pediatric Society is described in the article "Market Milk: A plan for its improvement."[a]

The forms for recording data regarding preliminary inspections of milk are shown in Appendix IV (p. 205).

The form for notice of condemnation of milk and stub for same are shown in Appendix IV (p. 207).

The milk supply has improved in quality, records showing that the percentage found adulterated has fallen from 11.15 in 1892 to about 1.50 in 1900. Suggested improvements include legislation providing for a higher standard for milk and for periodical, thorough, veterinary and sanitary inspection of dairy cattle and dairy farms, and the awarding of certificates where conditions are found to be satisfactory. It is believed that the most practical way to provide for the inspection of dairies, especially those in other States, is to require each dairyman to secure a permit before commencing to sell milk in the city, the permit to be based upon the conditions at his dairy and to be revocable.

Pittsburg. (Population, 321,616.)

[For comparison with other cities in Class I, see p. 28.]

Albert H. Edwards, meat and milk inspector.

Estimated average amount of milk used daily is 30,000 gallons (including the milk and cream used in the ice-cream business), or 0.75 pint per capita. Milk is distributed from 1,230 stores and 425 wagons About 4,000 gallons is pasteurized; this treatment, however, does not seem to be gaining in favor. Only a small part of the milk is delivered in bottles, and they are filled in the city. The retail price of milk is 6 to 8 cents per quart in summer and 8 to 10 cents in winter, producers on the farm being paid 3 cents and 3¾ cents in the two seasons. There are 3 or 4 "model dairies" near the city, the milk from which is sold at 10 cents per quart throughout the year. There are 241 dairy herds within the city limits. About 90 per cent of the milk supply is received by railway, the longest shipment being 50 miles.

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[a] Seventeenth Annual Report of Bureau of Animal Industry, pp. 158-193.

The city publishes State laws referring to market milk.

In the supervision of its milk supply the city expends annually about $3,000. One official, an assistant milk inspector, gives his entire time to the work, and another a part of his time. During the year 4,997 samples of milk were examined by Babcock test and gravimetric analysis; no bacteriological examinations were made.

The most marked recent improvement has been in facilities for caring for milk. Suggested improvements include thorough inspection of all dairy farms and cattle, sterilizing or thorough scalding of all milk vessels, and examination of cattle for tuberculosis twice a year.

Allegheny. (Population, 129,896.)

[For comparison with other cities in Class I, see p. 28.]

John Lippert, meat and milk inspector.

It is etimated that 5,000 gallons of milk are used daily, an average of 0.31 pint per capita. Milk is distributed from 160 stores and 400 wagons. The few bottles used in its delivery are filled in the city. A considerable portion of the milk supply is pasteurized, and the use of such is increasing. The retail price of milk is 6 cents per quart in summer and 8 cents in winter; the producers on the farm receive 3 and 4½ cents per quart in the two seasons. Within the city limits there are 38 herds, including 500 cows. Milk is sent into the city from 90 dairy farms; about two-thirds comes by railway, and the longest shipment is 150 miles.

The city has no milk ordinance; the State laws alone regulate the milk supply.

There is expended annually $2,700 in the supervision of the city milk supply. One inspector and one bacteriologist give all or a large part of their time to this work. About 2,000 samples were examined for fat content and 180 for tubercle and typhoid bacilli, and all of the dairies in the city were inspected during the past year.

The enactment of milk ordinances is strongly recommended.

Scranton. (Population, 102,026.)

[For comparison with other cities in Class I, see p. 28.]

Fred. J. Widmayer, food and milk inspector.

The estimated amount of milk used daily is 7,000 gallons, or 0.55 pint per capita. Milk is distributed from 170 stores and 125 wagons, and about 75 per cent of it is delivered in glass jars. A number of the large concerns, handling perhaps half of the jars, do their bottling at milk-receiving stations in the country. Little, if any, pasteurized milk is used. The retail price of milk is 6 cents per quart in summer and 7 cents in winter, producers receiving 1¾ cents in summer and 2⅞ cents in winter. No dairy near the city is conducted in what might be called an entirely satisfactory manner. There are only two herds within the city limits; they include 25 cows. Milk is sent into the city from about 400 dairy farms, the most distant being 30 miles.

The milk supply is regulated by State laws applying to cities of the second and third classes, and by a few sections enacted several years ago by the city board of health. The latter provide as follows: The sale of adulterated milk, milk with any foreign substance added, or milk "from cows fed upon brewery grains or other deleterious substances," is prohibited. Wholesale and retail dealers are required to procure licenses annually from the board of health and display same prominently.

All milk cans must be numbered, and cans containing skimmed milk must be plainly labeled. Delivery wagons shall show the name of owner and number of license.

About $1,200 per year is expended by the city in the supervision of its milk supply. One food and milk inspector gives his entire time to this work. In the past year 2,612 samples of milk were examined by the lactometer and the Babcock test; no bacteriological examinations were made. None of the dairies, either within or outside the city, have been inspected.

There has recently been a decrease in the practice of adulterating milk by the addition of water. Needed improvements as given include the extension of the inspector's authority to dairies beyond the city limits, frequent inspection of those dairies, and regulations as to the use of ensilage and brewers' grains.

Reading. (Population, 78,961.)

[For comparison with other cities in Class II, see p. 32.]

Peter Texter, market commissioner.

The daily consumption of milk is estimated as 4,200 gallons, or an average of 0.43 pint per capita, besides 1,400 gallons of skimmed milk and 175 gallons of cream. Milk is sold from about 20 stores and 145 wagons. A very small amount of milk is delivered in glass bottles, and these are filled at the farms. One-seventh of the milk is pasteurized, and the practice is gaining in favor. The consumers pay 6 cents and the producers receive 3 cents per quart for milk throughout the year. There are no herds within the city limits. Milk is brought to the city in wagons from 145 dairy farms, the longest haul being 8 miles.

The city prints State laws regulating the milk supply.

There is expended annually $185 in the supervision of the milk supply. The market commissioner gives a part of his time to this work. During the past year 121 samples of milk were examined by the lactometer; no bacteriological examinations were made.

Erie. (Population, 52,733.)

[For comparison with other cities in Class II, see p. 32.]

J. K. Hallock, secretary of the board of health.

The daily consumption of milk is estimated as 3,600 gallons, or an average of 0.54 pint per capita, besides 250 gallons of skimmed milk and 150 gallons of cream. Milk is sold from 123 stores and 78 wagons. A very limited amount of milk is delivered in glass bottles which are filled at the producing farms and in the city. Very little milk is pasteurized, and the practice is not increasing. The retail price of milk is 5 cents per quart throughout the year, producers receiving 2½ and 2¾ cents in summer and winter, respectively. There are no "model dairies" near the city. Within the city there are 3 herds, including 25 cows. Wagons bring in milk from 100 dairy farms, the longest haul being 15 miles.

Rules and regulations (17 sections) of the board of health refer to the city milk supply. Permits for the sale of milk or cream are issued free of charge. Adulterated, etc., milk is prohibited. Cows supplying milk must be examined by a veterinarian (not necessarily with the tuberculin test) within one year. Cow stables must be clean and, like milk rooms, must be properly located and constructed. From June to September milk and cream vehicles must be equipped with ice boxes. Milk bottles, etc., must be properly cleaned after use, and must not be taken from a quarantined house without the permission of the board of health. Persons exposed to or suffering from contagious disease must not handle milk or cream for sale. The food inspector must inspect, at least once a month, all stores and wagons from which milk is sold and take samples therefrom for analysis.

For the full text of the rules and regulations of the board of health concerning the milk supply, see Appendix I (p. 174).

During the past year 1,758 samples of milk were examined by the Babcock test, and by gravimetric analysis, the lactometer being used in a few instances. No bacteriological examinations were made. All the city herds and all the dairy farms were inspected. The large number of samples examined shows that the law requiring the inspection of each dealer's milk once a month is well observed.

The form used for application for milk license is shown in Appendix IV (p. 189).

The form for report upon inspection of dairies is shown in Appendix IV (p. 196).

Wilkesbarre. (Population, 51,721.)

[For comparison with other cities in Class II, see p. 32.]

Walter Davis, M. D., water and milk inspector.

The daily consumption of milk is estimated as 2,890 gallons, or an average of 0.45 pint per capita. This is sold from about 40 stores and 60 wagons. Only one dealer supplies milk in glass bottles, and these are filled some in the city and some in the country. A very small quantity of milk is pasteurized; and the practice is not increasing. The retail price of milk is 6 cents per quart in summer and 8 cents in winter, producers receiving 2½ cents and 3½ cents in the two seasons. A few dairies are conducted in a very satisfactory manner, but receive no advance in price for their product. There are no city herds. Fifty-three dairy farms near the city furnish about one-half of the total supply; the balance is received by railway, the longest shipment being 130 miles.

An ordinance adopted in October, 1896, supplements the State laws in regard to the milk supply. Persons selling milk must register with the water and milk inspector and report to him the location of dairy farms.

The water and milk inspector (salary, $600) gives a part of his time to the supervision of the milk supply. During the past year 350 samples of milk were examined by the lactometer, and suspected samples by the Babcock test; and the 53 nearby dairy farms were inspected. On 15 farms conditions were found to be satisfactory, on 21 fairly satisfactory, and on the remainder unsatisfactory.

A milk laboratory and a dairy inspector are much needed.

Harrisburg. (Population, 50,167.)

[For comparison with other cities in Class II, see p. 32.]

The daily consumption of milk is estimated as 2,500 gallons, or an average of 0.40 pint per capita; also 1,000 gallons of skimmed milk and 125 gallons of cream. Milk is sold from 12 stores and 75 wagons. About 5 per cent of the total supply is delivered in glass bottles, and these are filled in the city. No milk is pasteurized. The retail price is 5 to 6 cents per quart in summer and 6 cents in winter, producers receiving 3 cents and 4 cents in the two seasons. The milk from one especially well-conducted dairy is sold for 7 cents per quart throughout the year. Within the city limits there are 2 dairy herds, including 20 head, and milk is sent in from 90 dairy farms. Only about 8 per cent of the milk supply is received by railway, the longest shipment being 15 miles.

The city exercises practically no supervision over its milk supply.

It has been suggested that the best way to improve the quality of the milk is to bring to the attention of the public the advantages of pure milk and encourage those who produce it; and that flagrant violations of the milk laws should be promptly prosecuted.

Lancaster. (Population, 41,459.)

[For comparison with other cities in Class III, see p. 38.]

M. W. Raub, secretary and physician of the board of health.

The estimated daily consumption of milk is 1,800 gallons, or 0.35 pint per capita, besides 50 gallons of cream. Milk is sold from 12 stores, 96 wagons, and 50 private houses. Three-fourths of the milk is delivered in glass bottles, half of these being filled on the farms and the rest in the city. About 150 gallons of milk is pasteurized daily, which practice is increasing very slowly. The retail price of milk is 5 to 6 cents per quart throughout the year, producers receiving 2½ to 3 cents. About 10 dairies are conducted in a satisfactory manner, their milk being sold at the regular price. Within the city limits there are 58 milch cows, kept in 28 stables, and milk is sent in from 145 dairy farms. Only 58 gallons of milk is received daily by railway, the longest shipment being 14 miles.

State laws, supplemented by city ordinances, govern the milk supply. The milk inspector is authorized to destroy all impure and adulterated milk. License fee for the sale of milk is $1, and $1 for each wagon after the first.

During the past year only $8 was expended by the city in the supervision of its milk supply; 505 milk samples were examined by the lactometer and Babcock test; all the city herds and 80 of the 145 dairy farms were inspected. The secretary of the board of health in 1898 made a thorough inspection of all the dairies producing milk for use in the city.

His annual report gives an interesting account of the conditions under which the milk supply is produced, and includes the following statement:

	Number.
Places inspected outside of city limits	76
Cows seen	950
Cows in first-class condition	700
Cows in middling condition	100
Cows in poor (unsanitary) condition	150
Cows died during the year	5
Acres farm land	6,024
Acres pasture	700
Stables inspected	76
Stables in good condition	50
Stables unsanitary	20
Quarts of milk furnished daily	6,000
Quarts of cream furnished daily	200
Food used. Corn, chop, bran, ship stuff, malt, and pasture:	
Places using malt with other food	22
Places using malt alone	2
Places using pasturage alone	2
Total milk houses inspected	68
Total milk houses, sanitary and best condition	55
Total milk houses, good (ventilation wanting)	13

Cans and vessels for milking and storing almost all neat, clean, and well cared for.

Recent improvement has been shown in the cleanliness of stables and care in handling milk. A law regulating the sanitary condition of dairies is said to be much needed.

Altoona. (Population, 38,973.)

[For comparison with other cities in Class III, see p. 36.]

J. D. Miller, health officer.

Estimated daily consumption of milk is 3,500 gallons, or 0.72 pint per capita. Milk is sold from 25 stores and 40 wagons. Four dairies deliver milk in glass bottles, and these are filled both in the city and at the farms. Little or no milk is pasteurized. The retail price of milk is 6 cents per quart in summer and 7 cents in winter, producers receiving 4 and 5 cents in the two seasons. Within the city limits there are 2 herds, including 20 cows. About 50 per cent of the milk is received by railway, the longest shipment being 15 miles.

Nothing is expended by the city in the supervision of its milk supply. During the past year 36 samples of milk were analyzed by the State chemist, and no bacteriological examinations were made.

A recent improvement in the quality of the milk is due to a decrease in the use of formaldehyde.

Johnstown. (Population, 35,936.)

No reply to inquiries was received.

Allentown. (Population, 35,416.)

[For comparison with other cities in Class III, see p. 36.]

Morris F. Cawley, health officer.

Milk retails at 6 cents per quart throughout the year.

The city does practically no inspection work, and no record of the milk supply is kept. During the past year 40 milk samples were examined by Marchand's test.

McKeesport. (Population, 34,227.)

[For comparison with other cities in Class III, see p. 38.]

A. C. Wallace, secretary of the board of health.

The estimated daily consumption of milk is 2,000 gallons, or 0.47 pint per capita. Milk is sold from a number of stores and 50 wagons. Within the city limits there are 15 herds, including 30 cows, and about 12 dairy farms send milk into the city, the longest distance being 5 miles.

During the past year no inspection work has been done.

Chester. (Population, 33,988.)

[For comparison with other cities in Class III, see p. 38.]

W. G. Monroe, secretary of the board of health.

The daily consumption of milk is estimated as 1,625 gallons, or 0.38 pint per capita, besides 600 gallons of skimmed milk. Milk is sold from 28 stores and 59 wagons. Retail price of milk is 6 cents per quart in summer and 8 cents in winter, producers receiving 3 and 4 cents, respectively. Milk is supplied from 70 dairy farms. One hundred gallons is received by railway daily, the longest shipment being 10 miles.

The city has no milk inspector.

York. (Population, 33,708.)

[For comparison with other cities in Class III, see p. 38.]

Francis X. Weil, M. D., health officer.

Estimated daily consumption of milk is 1,350 gallons, or 0.32 pint per capita, besides 150 gallons of skimmed milk and 25 gallons of cream. Milk is sold from about 25 stores and 40 wagons. Three-fourths of the milk supply is delivered in glass bottles filled in the city. Pasteurized milk is delivered by only 1 wagon, and its use is not increasing. Milk is retailed at 5 cents per quart throughout the year, producers being paid 3 cents. There are no "model dairies" near the city, and no dairy herds within the city limits. Milk is sent in from 28 dairy farms, all within 8 miles of the city; none is received by railway.

The city has an ordinance forbidding the sale of adulterated milk, but exercises no supervision over its milk supply.

Williamsport. (Population, 28,757.)

[For comparison with other cities in Class III, see p. 38.]

C. W. Youngman, M.D., health officer.

Estimated daily consumption of milk is 875 gallons, or 0.24 pint per capita. Milk is sold from 14 stores and 90 wagons. About one-half is delivered in glass bottles filled at the farms. No milk is pasteurized. Retail price of milk is 5 cents per quart in summer and 6 cents in winter, producers receiving 2½ and 3 cents, respectively. The milk from 3 well-conducted dairies near the city is sold at the regular price. Within the city limits there are 4 herds, including 25 cows, and milk is sent in from 127 dairy farms. About one-seventh is received by railway, the longest shipment being 50 miles.

The health officer (salary $1,000) gives a part of his time to the supervision of the city milk supply. During the past year 73 milk samples were examined by lactometer and cream gauge; no bacteriological examinations were made; all the city herds and all the dairy farms were inspected. A report of the conditions obtaining at the dairy farms is published annually in the daily papers by the board of health. The dairies are divided into three classes: The first includes those having everything necessary for the production of good milk, the second those less well equipped, and the third includes dairies having the poorest equipment.

Newcastle. (Population, 28,339.)

[For comparison with other cities in Class III, see p. 38.]

W. H. Vance, health officer.

The estimated daily consumption of milk is 700 gallons, or 0.20 pint per capita, besides 150 gallons of skimmed milk and 150 gallons of cream. Milk is sold from about 75 stores and 75 wagons, and is retailed at 6 cents per quart in summer and 7 cents in winter. There are no dairy herds within the city limits. Milk is sent in from 75 dairy farms, all within a radius of 7 miles of the city.

The city has no milk ordinance and exercises no supervision over its milk supply.

Easton. (Population, 25,238.)

No reply to inquiries was received.

Lebanon. (Population, 17,628.)

[For comparison with other cities in Class IV, see p. 42.]

W. L. Brunner, secretary of the board of health.

The daily consumption of milk is estimated as 1,500 gallons, or an average of 0.68 pint per capita, besides 200 gallons of skimmed milk and 300 gallons of cream. Milk is sold from 45 wagons, a large amount being delivered in glass bottles filled both at the farms and in the city. No milk is pasteurized. The retail price is 6 cents per quart throughout the year, producers receiving 2 cents and 3 cents in the two seasons. There are no "model dairies" near the city. Within the city limits there are 15 herds, including about 60 cows, and milk is brought in wagons from 60 dairy farms, the longest haul being 8 miles.

The city has no milk ordinance.

About $100 is expended annually in the supervision of the milk supply. During the past year 70 samples of milk were examined by the Babcock test, no bacteriological examinations were made; 12 of the 15 city herds, but none of the dairy farms, were inspected.

Meadville. (Population, 10,291.)

[For comparison with other cities in Class IV, see p. 42.]

C. Courtney McLean, V. S., milk inspector.

The daily consumption of milk is estimated as 875 gallons, or 0.68 pint per capita. Milk is sold from 2 stores and 30 wagons. Perhaps one-fifth of it is delivered in glass bottles, most of these being filled at the farms; none is pasteurized. The retail price is 6 cents per quart throughout the year, producers receiving 3 cents. There are no "model dairies" near the city. Milk is brought in wagon from 30 dairy farms (489 cows), the longest haul being 4 miles.

There is no herd within the city.

Board of health rules Nos. 9, 36, 50, and 56–66 refer to milk. Any person wishing to sell milk must apply for an inspection of his cattle, appointments, etc., and agree to observe certain regulations. The milk inspector must, previous to the issuing of permits, and annually, inspect all dairies, cows, and appointments for supplying milk for sale in the city. Milk from diseased cows, adulterated milk, etc., is prohibited. The milk standard is 12.5 per cent solids, 3.5 per cent fat, specific gravity between 1.029 and 1.033. Milk exposed to infection by contagious disease shall not be sold.

There is expended annually $200 in the supervision of the milk supply, one official giving a part of his time to this work. During the past year 976 samples were examined by lactometer and Babcock test; no bacteriological examinations were made; all the dairy farms were inspected. The milk inspector has published, in a little pamphlet, the milk regulations, together with practical suggestions for the guidance of dairymen. These cover the stabling, feeding, and care of cattle, and the care of milk.

The form used for making application for inspection is shown in Appendix IV (p. 189).

Recently more care in cooling and cleaner methods have obtained at dairies. It is stated that inspections should be more frequent and that the rules should be enforced requiring the exclusion of unhealthy cows from dairy herds, the proper care and handling of milk, etc.

Phœnixville. (Population, 9,196.)

[For comparison with other cities in Class IV, see p. 42.]

E. M. Massinger, V. S., veterinary inspector.

The daily consumption of milk is estimated as 725 gallons, or 0.63 pint per capita, besides 30 gallons of skimmed milk and 10 gallons of cream. Milk is sold from 3 stores and 37 wagons. About one-third of the dealers deliver milk in glass bottles filled at the farms; none is pasteurized. The retail price is 5 cents per quart throughout the year, producers receiving 2 to 2½ cents in summer and 3 to 3½ cents in winter. Within the city limits there are 7 herds, including about 60 cows, and milk is brought in wagons from 55 dairy farms, the longest haul being 5 miles.

An ordinance in effect July, 1894, refers to milk. License is required for the sale of milk. Impure, adulterated, etc., milk is prohibited, and may be destroyed. The milk standard is 12.5 per cent solids, 3 per cent fat, specific gravity not less than 1.029. Skimmed milk must be labeled and contain 2.5 per cent fat, 6 per cent of cream by volume.

About $100 is expended in the supervision of the milk supply. During the past year 496 samples were examined by the lactometer, and 8 of the 55 dairy farms were inspected.

The inspector recommends an ordinance excluding all tuberculous cows from dairy herds.

RHODE ISLAND.

General laws of 1896, chapter 147; and laws of 1896, chapter 333; and 1900, chapter 785, refer to milk, etc. The mayor and aldermen of any city and the council of any town may select milk inspectors; in Providence this is compulsory. Notice of the selection shall be published. Inspectors shall record names and addresses of persons selling milk, take samples of milk supposed to be impure, etc. They may appoint sample collectors. Chiefs of police, milk inspectors, special constables, etc., may prosecute. The sale of milk from cows fed upon distillery refuse or other deleterious substance, or milk from diseased cows or milk to which water or any foreign substance has been added, is forbidden. The milk standard is 12 per cent solids, 2.5 per cent fat. Skimmed milk must be plainly labeled. The name and address of any person convicted shall be published in his town or county. Milk is required to be sold by wine measure, and measures used in its sale must be sealed.

Providence. (Population, 175,597.)

[For comparison with other cities in Class I, see p. 28.]

Walter O. Scott, inspector of milk.

The daily receipts of milk is estimated as 22,000 gallons, or 1 pint per capita, besides a small amount of skimmed milk and quite a large amount of cream. The amount of milk consumed as such can not be definitely stated because a large portion of the receipts is used in the butterine factories located in the city; also the official records are kept in such a manner that milk which is wholesaled may be recorded more than once. Milk is sold from 1,200 shops and 500 wagons. Glass bottles are used in the delivery of 3 per cent of the milk and 99 per cent of the cream, the former being bottled at the producing farms and the latter in the city. Little or no attention is given to the pasteurization of milk. The retail price of milk is 5 to 8 cents per quart in summer and 6 to 8 cents in winter. There are 6 or 8 dairies in this locality conducted in a satisfactory manner, but not receiving an extra price for their milk. The number of cows in the city is not known. It is estimated that one-third of the total milk supply is received by railway, the longest shipment being 60 miles.

State laws are depended upon to regulate the milk supply.

The supervision of the milk supply costs the city about $6,000 annually. Four officials—an inspector, two collectors of samples, and one clerk—give their entire time to the work. During less than half of the past year 3,178 samples of milk were examined either by the Babcock test or gravimetric analysis, or both. During the year examinations were made of 200 samples to determine bacterial content.

According to the milk inspector, the percentage of milk—that is, adulterated—found for sale in stores has fallen from 28.67 in 1898 to 11.79 in 1901, and in the same period the percentage of adulterated milk found on wagons has fallen from 17.12 to 7.34. During this time the prosecutions averaged in number about 6 per month. The city milk inspector appears at prosecutions only as a witness. Milkmen are prosecuted without warning if their milk contains less than 11.50 per cent total solids, and storekeepers are prosecuted without warning when their milk shows less than 11 per cent total solids, and after warning if below 11.5 per cent. The milk inspector's report contains much interesting matter regarding the production and handling of milk, and quite a full discussion of the work performed in his office.

Forms for keeping the records of the milk inspector's office by the "card system" are shown in Appendix IV (p. 210).

Needed improvements as given include the raising of the legal standard for milk to 3.5 per cent fat; the adoption of standards for cream and skimmed milk; the licensing of dealers so that dishonest persons can be kept out of the business; the delivery of milk to the consumer just as it is put up at the dairy or store, thereby preventing its being turned from one vessel to another on wagons in open air; the establishment of a State dairy bureau to have supervision of all the dairy interests of the State.

Pawtucket. (Population, 39,231.)

[For comparison with other cities in Class III, see p. 38.]

A. J. Johnson, jr., inspector of milk.

Estimated daily consumption of milk is 2,955 gallons, or 0.60 pint per capita, besides 75 gallons of skimmed milk. This is sold from 80 stores and 125 wagons. Glass bottles, filled at the farms, are used largely in the delivery of milk. No milk is pasteurized. The retail price of milk is 5 to 6 cents per quart in summer and 6 to 7 cents in winter, producers being paid 3 cents and 3½ cents, respectively. The milk from two "model dairies" is sold at 7 cents per quart throughout the year. There are no dairy herds in the city. Milk is sent in from 200 dairy farms. Only about 2 per cent is received by railway, the longest shipment being 5 miles.

About $400 is expended annually by the city in the supervision of its milk supply, the milk inspector giving a part of his time to this work. During the past year 300 samples of milk were examined by lactometer and gravimetric analysis; no bacteriological examinations were made; one dairy farm was inspected.

Recently the milk has improved in composition. It is recommended that milk dealers be licensed, so that the privilege to sell milk can be denied those who evade the law.

Woonsocket. (Population, 28,204.)

[For comparison with other cities in Class III, see p. 38.]

William C. Mason, city clerk.

This city has no ordinance regulating its milk supply, and information on this subject is not obtainable.

SOUTH CAROLINA.

Acts of 1896, No. 96, sections 1 and 2, refer to milk. It is unlawful for any person knowingly to sell impure or adulterated milk or milk from animals diseased or having ulcers, etc. The milk standard is 8.5 per cent solids not fat, 3 per cent fat. Skimmed milk and buttermilk, when sold, must not be misrepresented.

Charleston. (Population, 55,807.)

[For comparison with other cities in Class II, see p. 32.]

J. Mercier Green, M. D., health officer.

The daily consumption of milk is given as 720 gallons, or an average of 0.10 pint per capita, besides 8 gallons of skimmed milk and 1 gallon of cream. In explanation of this apparently low consumption, it is stated that many private families keep from 1 to 12 cows and dispose of milk and cream. The quantity of milk produced by these cows is unknown, and is not included in the above estimate. Milk is sold from 6 wagons. Only a very small quantity of milk is delivered in glass bottles, and little or none is pasteurized. The retail price of milk is 8 cents per quart throughout the year. There are no "model dairies" near the city. No milk is shipped in by railway, the greater part of it being brought in boats from the near-by islands.

The city expends nothing for milk inspection. During the past year the board of health made bacteriological examinations of 27 samples of milk; none of the herds within the city was inspected and only 1 dairy farm outside the city was inspected.

The passage and enforcement of an ordinance regulating the production and handling of milk is said to be much needed.

SOUTH DAKOTA.

C. P. Sherwood, State food and dairy commissioner, Desmet.

Laws of 1897, chapter 65, amended, and 1899, chapter 89, sections 23 to 29, and an act approved March 7, 1901, refer to foods and milk. The food and dairy commissioner shall enforce food and dairy laws, and may take samples for analysis, etc. Chemists at State institutions shall analyze samples. Cows for production of market milk shall not be kept in an unhealthy condition or fed upon food that will produce impure or unwholesome milk. It is unlawful to sell, without fully informing the buyer, any food that is adulterated, which term is defined at length.

TENNESSEE.

Public acts of 1897, chapter 45, refers to foods, and prohibits the sale of any food that is adulterated, which term is defined at length.

Memphis. (Population, 102,320.)

[For comparison with other cities in Class I, see p. 28.]

Felix Paquin, chemist and bacteriologist.

The daily consumption of milk is estimated as 6,400 gallons, or 0.05 pint per capita. Milk is sold from 40 stores (including hotels, etc.) and 168 wagons. There are no large milk depots in the city. Glass bottles are used in the delivery of about one-third of the milk, and they are filled at the producing farms. The entire product of one dairy is pasteurized, and finds ready sale. Consumers pay 6 cents per quart for milk throughout the year. There is one comparatively extra well conducted dairy in the locality which receives 8 cents per quart for its product. One hundred and eighty-eight dairy farms, having 3,554 cows, send milk into the city, quite a large amount of which is received by railway, the longest shipment being 527 miles.

According to reports there were within the city limits in the year 1899, 105 herds, including 891 cows; 55 of these "herds" consisted of from 1 to 3 cows each, which were kept for private use, and there were 115 dairy farms, having 1,723 cows, sending milk into the city. The longest distance milk was then sent to the city was 212 miles.

An ordinance passed in July, 1898, regulates the milk supply. Permit from the board of health is required for the sale of milk or any other dairy product. The permit number and name of dairyman must be shown on delivery wagons. The ordinance prohibits the sale of adulterated or unwholesome milk, including milk from animals diseased or kept under crowded or uncleanly conditions, or fed on distillery waste or other unhealthy food, or watered with polluted water; milk drawn from cows fifteen days before or five days after calving; milk which has been in containers that were dirty or were washed with polluted water; milk from which cream has been removed; and milk containing an antiseptic. The milk standard is 12 per cent solids, 3 per cent fat.

A copy of the milk ordinance is shown in Appendix I (p. 173).

About $1,200 is expended annually in the supervision of the city milk supply. One chemist and bacteriologist and 1 inspector of dairies and collector of milk samples give a part of their time to this work. During the year 1,083 samples were examined by the Babcock test, chemical analysis, microscopically, and bacteriologically; 36 examinations were made for pus cells and the bacilli of tuberculosis and typhoid fever; and 153 dairy farms were inspected. For the adulteration of milk 46 warrants were issued, and fines to the amount of $710 were imposed; 13 cows were destroyed on account of tuberculosis.

In the previous year 1,529 samples of milk were tested for fat by the Babcock test and 486 samples were examined for water and total solid content, preservatives, and microscopically for foreign substances; 11 bacteriological examinations were made; all of the city herds and 13 of the 188 dairies outside of the city, about which complaints had been made, were inspected; 49 warrants were issued for adulterating, use of preservatives, etc.; $505 in fines were imposed.

There has been great improvement in the quality of milk since the city inspection commenced about three years ago. It was then common to find 50 per cent added water and the free use of preservatives. Needed improvements include more frequent inspection of dairy farms and herds, the use of tuberculin where tuberculosis is suspected, more severe penalties for violation of the milk laws, and better methods of handling milk from its production to its sale.

Nashville. (Population, 80,865.)

[For comparison with other cities in Class II, see p. 32.]

Larkin Smith, M. D., city health officer.

The daily consumption of milk is estimated as 6,802 gallons, or an average of 0.67 pint per capita. Milk is sold from 13 stores and 198 wagons. There are no herds of milch cows within the city limits. Milk is sent in from 193 dairy farms, including 3,401 cows. Only a very small portion is shipped in by railway, the longest shipment being 18 miles.

An ordinance regulates the milk supply. Permits for the sale of pure milk are issued free of charge. Adulterated, impure, etc., milk is prohibited. The milk standard is 12.5 per cent total solids. Skimmed milk must be plainly labeled. Buttermilk may be sold.

During the past year 2,570 samples were examined for total solids and preservatives; no bacteriological examinations were made, and none of the dairy farms were inspected.

The permit for selling milk has printed upon it a full copy of the milk ordinance.

Knoxville. (Population, 32,637.)

No reply to inquiries was received.

Chattanooga. (Population, 30,154.)

[For comparison with other cities in Class III, see p. 38.]

C. A. Baker, clerk of the board of health.

This city has no milk inspector, and information regarding its milk supply is not available.

TEXAS.

Penal Code, 1895, page 80, chapter 2, article 433, defines the milk from a diseased cow as adulterated.

San Antonio. (Population, 53,321.)

[For comparison with other cities in Class II, see p. 32.]

F. Pascal, M. D., health officer.

The retail price of milk is 8 cents per quart in summer and 10 cents in winter. One dairy near the city is said to be conducted in an entirely satisfactory manner.

An ordinance adopted in July, 1901, refers to milk. Milk dealers must have a permit; fee, $1. Each milk vehicle must bear a metal tag or plate furnished by the city clerk. The sale of adulterated milk is prohibited.

There is practically no supervision of the milk supply.

Houston. (Population, 44,633.)

[For comparison with other cities in Class III, see p. 38.]

J. B. Massie, M. D., city health officer.

The estimated daily consumption of milk is 3,800 gallons, or 0.68 pint per capita, besides 100 gallons skimmed milk and 200 gallons of cream. This is sold from 3 stores and 109 wagons. Glass bottles are not used in the delivery of milk. The retail price of milk is 5 cents per quart throughout the year. There are no dairies near the city conducted in an entirely satisfactory manner. Within the city limits there are 19 herds, including 269 cows, and milk is brought to the city in wagons from 128 dairy farms, the longest haul being 6 miles.

An ordinance adopted in May, 1900, governs the sale of milk. Separate permits are issued free for each place of general sale or storage. The sale of impure, adulterated, etc., milk is prohibited. The milk standard is 12 per cent solids, 3.2 per cent fat. Carrying swill, garbage, etc., upon milk wagons is forbidden. Milk coming from outside the city must be exposed for inspection. Condensed milk and buttermilk must be from pure milk. In condensed milk the milk solids shall be equivalent to 12 per cent solids in crude milk, and 26.5 per cent of the solids shall be fat.

About $960 is expended annually by the city in the supervision of its milk supply, one milk and dairy inspector giving his entire time to this work. During the past year 4,775 samples of milk were examined by the lactometer and Babcock test; no bacteriological examinations were made; all the city herds and all the dairy farms were inspected.

Ordinance sections defining the terms adulterated, etc., and referring to milk brought into the city are given in Appendix I (p. 178).

There has been an improvement in the grade of cattle feed used and in the care of cattle.

Dallas. (Population, 42,638.)

[For comparison with other cities in Class III, see p. 38.]

J. H. Florence, health officer.

The estimated daily consumption of milk is 5,250 gallons, or 0.98 pint per capita. Milk is sold from 3 stores and 175 wagons. Ten per cent of the milk is delivered in glass bottles, some filled at the farms, others in the city. One establishment in the city pasteurizes milk and the practice is increasing. Milk is retailed at 4 to 5 cents per quart throughout the year. There are no dairy herds within the city. Milk is brought to the city in wagons from 150 dairy farms, within a radius of 8 miles.

The amount expended in the supervision of the city milk supply is not kept separate from the other expenditures of the board of health. During the past year milk samples were examined by the lactometer; all the dairy farms were inspected. The watering of milk and use of boric acid are common forms of adulteration.

Galveston. (Population, 37,789.)

[For comparison with other cities in Class III, see p. 38.]

C. H. Wilkinson, health physician.

About 5 per cent of the milk is delivered in glass bottles, but none is pasteurized. Milk retails for as high as 15 cents per quart throughout the year. Within the city limits there are 10 herds, including 50 cows. About 10 per cent of the total milk supply is received by railway, the longest shipment being 29 miles.

The city has no milk ordinances, and exercises no supervision over its milk supply, but 8 of the city herds were examined during the past year.

As a means of improving the milk supply consumers are urged to patronize honest dairymen whose methods are cleanly.

Fort Worth. (Population, 26,688.)

[For comparison with other cities in Class III, see p. 38.]

H. C. Whitehead, M. D., city health officer.

The city has no milk inspector and no regulations regarding the milk supply, except a general provision referring to milk exposed for sale.

UTAH.

Moroni Heiner, State dairy and food commissioner, Morgan City.

Laws of 1896, chapter 60, sections 1 to 5, and laws 1897, chapter 54, refer to milk, etc. The dairy commissioner is charged with the enforcement of all laws concerning dairy products. County attorneys shall assist. It is unlawful to sell as pure any milk that is adulterated, skimmed, or impure, which includes milk from a cow within 20 days before and 5 days after parturition or from a cow that has a disease, ulcers, etc. Skimmed milk must be plainly marked; its standard is 9 per cent solids not fat. Standard tests and lactometers may be used to determine quality. Preservatives are prohibited.

Salt Lake City. (Population, 53,531.)

[For comparison with other cities in Class II, see p. 32.]

Horace H. Smith, clerk of the board of health.

The daily consumption of milk is estimated as 2,300 gallons, or an average of 0.34 pint per capita. This is sold from 20 stores and 57 wagons. Seventy dairymen hold permits from the board of health. About two-thirds of the milk is delivered in glass bottles filled in the city. Fifty per cent of the total supply is pasteurized and the practice is increasing. The retail price of milk is 5 cents per quart throughout the year, producers receiving 2¼ to 2½ cents in summer and 2½ cents in winter. The milk from two especially well-conducted dairies is sold at the regular price. About 1,000 gallons of milk is produced by cows kept by private families. In addition to these there are within the city limits 25 herds, including 250 cows. The longest shipment of milk to the city by railway is 35 miles.

An ordinance adopted in August, 1894, amends a previous milk ordinance. Permits for the sale of pure milk are granted after the premises, cows, and milk vessels have been inspected and a sample of the milk has been analyzed. Yearly license fee shall be paid as follows: On daily sales of not more than 2 gallons, $1; on daily sales of 2 gallons and not more than 5 gallons, $3; on each additional 5 gallons or part thereof sold daily, $2.50. Adulterated, etc., milk is prohibited. The milk standard is total solids, 12 per cent; fat, 3 per cent; solids not fat, 9 per cent; ash, 0.68 per cent.

During the past year the office of food inspector was abolished, and there has since been very little supervision of the milk supply. Forty samples of milk were examined by the lactometer and Babcock test, and 15 were tested for preservatives.

The form for report upon inspection of dairies is shown in Appendix IV (p. 196).

Recent improvements in the milk are attributed largely to the decreased use of brewers' malt and the increase in the practice of pasteurization. The present need, as stated, is the instruction of milk producers in cleanly methods.

VERMONT.

Statutes of 1894, sections 4300, 4327 to 4331, and 4975; laws of 1898, Nos. 81 and 115, refer to milk, etc. No person shall sell milk that is diluted with water, adulterated, or skimmed. The milk standard is 12.5 per cent total solids, 9.25 per cent solids not fat, except in May and June, when it is 12 per cent total solids. Results of analyses at the State agricultural experiment station are competent evidence for prosecution. Milk tests for the basis of payments must be accurate, and persons making such tests must hold certificates. Wine measure is the standard measure. The State board of health is authorized to make chemical and bacteriological examinations of milk.

VIRGINIA.

Acts of 1899–1900—page 694, chapter 655, refers to foods. It provides that the State board of agriculture shall examine samples of foods and may publish results. It forbids the sale of any food that is adulterated, which term is defined at length.

Richmond. (Population, 85,050.)

[For comparison with other cities in Class II, see p. 32.]

John A. Haley, secretary of the board of health.

The daily consumption of milk is estimated as 4,000 gallons, or an average of 0.38 pint per capita, besides 100 gallons of cream. Milk is sold from 100 stores and 150 wagons. Glass bottles, filled in the city, are used in the delivery of a small portion of the milk supply. No milk is pasteurized. The retail price of milk is 6 cents per quart throughout the year, producers receiving 3½ cents. There are no "model dairies" near the city, nor are there any dairy herds within the city limits. Milk is supplied from 150 dairy farms. Five per cent is received by railway, the longest shipment being 35 miles.

There is no inspection of milk or dairies.

Norfolk. (Population, 46,624.)

[For comparison with other cities in Class III, see p. 38.]

A. P. Pannill, secretary of the board of health.

This city has no milk ordinance and no milk inspector, and does not exercise supervision over the milk supply.

WASHINGTON.

E. A. McDonald, State dairy and food commissioner, Seattle.

Laws of 1899—chapter 43 refers to milk, etc. It is the duty of the State dairy commissioner to enforce all laws relating to dairy products. Chemists at State institutions shall make analyses. Attorney-general and county attorneys shall give legal assistance. Persons selling milk in cities and towns must obtain a license annually in June, from the dairy commissioner, at a cost of $1. A separate license is required for each vehicle, and the latter must show license number and owner's name and business address. It is unlawful to sell as pure any milk that is impure, adulterated, or skimmed, including milk known to be from cows diseased or having ulcers, etc., or within fifteen days before and four days after parturition; milk from cows kept in an unhealthy condition or fed on distillery waste or other putrefying or unhealthful substance; milk exposed to contamination by persons or animals, or milk to which preservatives have been added. And it is unlawful to sell cream from impure or diseased milk. The milk standard is 8 per cent solids not fat, 3 per cent fat. The cream standard is 18 per cent fat. Skimmed milk may be sold only when plainly marked. Proprietors of dairies and all milk venders must report to the dairy commissioner the amount of milk handled. Milk dealers must have their cans marked to show capacity.

Laws of 1899—chapter 113 refers to foods. It forbids the sale of food that is adulterated, and this term is defined at length.

There were 391 licenses issued by the dairy commissioner in the past year. By counties they were as follows:

Adams	1	Kittitas	3	Stevens	1
Chehalis	16	Lewis	1	Thurston	1
Clallam	5	Lincoln	7	Walla Walla	10
Clarke	5	Mason	3	Whatcom	11
Cowlitz	1	Okanogan	2	Whitman	10
Ferry	4	Pacific	9	Yakima	4
Franklin	2	Pierce	48		
Island	1	Skagit	2	Total	391
Jefferson	7	Snohomish	20		
King	139	Spokane	78		

Forty-four samples of milk have been analyzed and all of them found to be unadulterated.

Seattle. (Population, 80,671.)

[For comparison with other cities in Class II, see p. 32.]

M. E. A. McKechnie, M. D., health officer.

L. M. Woodcock, milk and dairy inspector.

The daily consumption of milk is estimated as 9,200 gallons, or an average of 0.91 pint per capita, beside 400 gallons of skimmed milk and 700 gallons of cream. Milk is sold from 142 stores and 87 wagons. A very limited amount of milk is delivered in glass bottles, and these are filled in the city. Only one firm pasteurizes milk, and the practice is not increasing. The retail price of milk is 5 cents per quart in summer and 7 cents in winter, producers receiving 2½ cents and 3½ cents in the two seasons. There are no "model dairies" near the city. Within the city limits there are 21 herds, including 400 cows, and milk is sent in from 76 dairy farms. About two-thirds of the total milk supply is received by railway, the longest shipment being 44 miles.

The milk standard is said to be 3 per cent fat, 9 per cent other solids.

About $1,200 is expended annually in the supervision of the city milk supply, one official—a milk and dairy inspector—giving his entire time to this work. During the past year 2,400 milk samples were examined by the Babcock test; 117 samples were analyzed gravimetrically; no bacteriological examinations were made; all the city herds and all the dairy farms were inspected.

Recently there has been a marked decrease in the sale of adulterated milk. Needed improvements, as given, include better dairy buildings and greater care in the production and handling of milk.

Tacoma. (Population, 37,714.)

[For comparison with other cities in Class III, see p. 38.]

Harry H. Collier, deputy State dairy commissioner.

The number of cows supplying milk to Tacoma is 1,100, and these are included in 21 herds. Two hundred and six milk samples were tested in six months in the past year.

Spokane. (Population, 36,848.)

[For comparison with other cities in Class III, see p. 38.]

James Bullivant, V. S., deputy State dairy commissioner.

The estimated daily consumption of milk is 2,500 gallons, or 0.54 pint per capita; also 200 gallons of cream. Milk is sold from 8 stores and 45 wagons. About one-fifth of the milk is delivered in glass bottles, filled in the city, by 3 or 4 dealers.

One dairy during the hot months pasteurizes milk. The retail price of milk is 6 cents per quart in summer and 8 cents in winter, producers receiving 3¾ cents in the summer season. There are no "model dairies" near the city. Within the city limits there are 6 herds, including 200 cows. The longest shipment of milk to the city is 50 miles.

During the past year 650 samples of milk were examined by the Babcock test; all of the city herds but none of the dairy farms were inspected; and 1 cow was examined for tuberculosis.

WEST VIRGINIA.

Code of 1891, chapter 150, section 20, refers to foods. It is unlawful to sell any article of food or drink that is not what it is represented to be.

Wheeling. (Population, 38,878.)

[For comparison with other cities in Class III, see p. 38.]

S. L. Jepson, M. D., ex-health officer.

The daily consumption of milk is estimated as 4,000 gallons, or 0.82 pint per capita, besides a small quantity of skimmed milk and 400 gallons of cream. Milk is sold from 140 stores and 120 wagons. Glass bottles are not used to a very great extent in the delivery of milk. They are filled some at the farms and some in the city. Milk is pasteurized only when prescribed by physicians. The retail price of milk is 6 cents per quart in summer and 8 cents in winter, producers receiving 3 and 4 cents, respectively. There are no "model dairies" near the city. Within the city limits there are 10 herds, including 100 cows, and milk is sent in from 125 dairy farms. About one-third of the milk is received by railway, the longest shipment being 30 miles.

The city has no milk ordinance, and no supervision is exercised over its milk supply.

The health officer believes that all milk dealers should be licensed, a milk standard should be fixed, and dairies should be inspected by a city official.

WISCONSIN.

H. C. Adams, State dairy and food commissioner, Madison.

The dairy laws have been compiled and in 1899 they were published in 22 sections by the State dairy and food commissioner. It is the duty of that officer to enforce laws regarding dairy products. County district attorneys shall assist. Necessary authority is given for inspections, samples may be taken (duplicate to owner when requested), etc. It is unlawful to sell as pure any milk that is impure, adulterated, or unwholesome, including diluted or skimmed milk, milk from a cow known to be within fifteen days before or four days after parturition, or having ulcers, etc. And it is unlawful to sell milk that was handled in unclean vessels, or milk from cows that are diseased, kept in unsanitary conditions, or fed on unwholesome food, or refuse or slops from a distillery or vinegar factory, unless such slop "be mixed with other dry sanitary grain or food to a consistency of a thick mush;" or milk to which a preservative or any foreign substance has been added; but viscogen or sucrate of lime may be used to restore viscosity to pasteurized milk or cream if its use is made known. The milk standard is 3 per cent fat.

The sale of any adulterated food is prohibited, such an article being defined at length.

So far as its limited force permits, the dairy and food commission cooperates with local authorities in the supervision of the market milk supply. Last year State authorities made examinations in Milwaukee, Wausau, Janesville, Madison, Watertown, Racine, Kenosha, and Merrill. A few years ago brief statements of conditions found at dairies were published in the commissioner's annual report. The statements relating to two dairies—a good one and a poor one (names of persons being here omitted)—are as follows:

Number of cows, 32; condition of stock, good, clean; condition of stables, clean; utensils, clean; feed, brewers' grains, corn feed, clover hay; well water. A good, clean dairy. Inspected (second visit) April 7, 1898.

Number of cows, 9; condition of stock, very dirty, manure on hips and belly; condition of stables, dirty; utensils not seen; feed, brewers' grains, middlings, and hay; city water. Sickness prevented proper care; so informed by proprietor. No improvement since March 29, 1898. Drainage poor. Inspected February 27, 1899.

The commissioner's report shows, also, that a large number of samples of milk delivered to butter and cheese factories, as well as to cities and towns, have been examined for fat content. A few bacteriological examinations have been made by the bacteriologist of the State University.

It is estimated that not 10 per cent of the milk sold is delivered in glass bottles and probably not more than 1 per cent of the total is pasteurized; this latter treatment is increasing. The average retail price of milk in cities and towns varies from 4 to 6 cents. Milwaukee is the only city in which any considerable portion of the milk supply is handled by middlemen, and the country producers supplying that city receive an average of about 2½ cents per quart for their milk.

Recent improvements in the milk supply are due to better dairy cattle, producing a higher grade of milk, and improved methods of caring for cows and handling milk.

Milwaukee. (Population, 285,315.)

[For comparison with other cities in Class I, see p. 28.]

W. C. Bennett, M. D., analyst.

The daily consumption of milk is estimated as 25,000 gallons, or 0.70 pint per capita, besides 600 gallons of cream and an unknown quantity of skimmed milk. Milk is sold from about 500 stores and 600 wagons. About one-tenth of the supply is delivered in glass bottles, and these are filled in the city. Trade in pasteurized milk is unimportant. The retail price of milk is 5 cents per quart in summer and 5 to 6 cents in winter, the producers receiving 2 cents in summer and 2½ cents in winter. There are no "model dairies" in or near the city. Within the city limits there are 117 dairy herds, including 643 head; the number of dairy farms sending milk into the city is unknown. About one-fourth of the entire supply is received by rail, the longest shipment being 72 miles.

An ordinance adopted by the city council October, 1891, requires that each person dealing in milk shall procure a license from the health commissioner who must first be satisfied with the sanitary condition of the dairy premises of the applicant; license fee, $1. Covered delivery wagons must be used during the entire year. Adulterated and skimmed milk, milk from cows fed on distillery waste or other unwholesome food, milk from any place where there is a contagious disease, or milk from tuberculous cows, is prohibited. The use of wholesome brewers' grains is allowed. The milk standard is 12 per cent solids, 9 per cent solids not fat. Inspectors are authorized to pour illegal milk upon the ground. Skimmed milk may be sold, if in vessels plainly labeled; it must contain 9 per cent solids not fat.

The ordinance section requiring covering on milk delivery vehicles is shown in Appendix I (p. 179).

About $1,500 is expended annually in the supervision of the city milk supply, the entire time of no one officer being given to this work. During the past year a large number of samples of milk were examined for fat content by the Babcock test; no samples were examined bacteriologically; 70 of the 117 herds within the city limits were inspected; none of those out of the city were inspected.

There has been a slight improvement in the composition and cleanliness of milk. Needed improvements include the application of the tuberculin test, so far as practicable; a municipal milk farm and laboratory to produce milk for infants' use; more perfect control of the sanitary conditions at the dairies outside of the city limits; more economical delivery, and an intelligent enforcement of the milk laws and ordinances.

Superior. (Population, 31,091.)

[For comparison with other cities in Class III, see p. 38.]

J. M. Ruggles, secretary of the board of health.

Milk is sold from 2 stores and about 40 wagons. About 27 herds, including over 400 cows, are within the city limits, and milk is sent in from dairy farms as far distant as 140 miles form the city.

Board of health ordinances, sections 47 to 52, refer to milk. License fee for sale of milk is 50 cents for each store and each wagon. Adulterated, etc., milk is prohibited. The milk standard shall from time to time be fixed by the board of health, but is subject to change by the common council.

The meat and milk inspector's monthly report is published in the city papers, and shows the names of dairymen visited, the number of cows kept by them, the per cent of fat in their milk, the kinds of feed used, the source of water supply, and the general appearance of the stock and barns.

Racine. (Population, 29,102.)

[For comparison with other cities in Class III, see p. 38.]

Fred Pfister, health officer.

The estimated daily consumption of milk is 1,800 gallons, or 0.49 pint per capita, besides 100 gallons of skimmed milk and 50 gallons of cream. Milk is sold from 20 stores and 40 wagons. About 15 per cent of the milk supply is delivered in glass bottles filled at the farms, but none is pasteurized. The retail price of milk is 5 cents per quart throughout the year, producers being paid 2½ cents. There are no dairy herds within the city limits. Milk is brought in wagons from 50 dairy farms, the longest haul being 8 miles.

The city expends nothing in the supervision of its milk supply. During the past year 10 samples were examined by the Babcock test, lactometer, and pycnometer; no bacteriological examinations were made, and none of the dairy herds were inspected.

It is said that several well-conducted dairies near the city, supplying milk to a proprietary food company, have by their example assisted in bringing about improvements in other dairies.

La Crosse. (Population, 28,895.)

[For comparison with other cities in Class III, see p. 38.]

Richard D. Murphy, health officer.

The daily consumption of milk is estimated as 1,000 gallons, or 0.28 pint per capita, besides 100 gallons of skimmed milk and 100 gallons of cream. Milk is sold from 50 stores and 30 wagons. Five per cent of the milk is delivered in glass bottles filled at the farms. None is pasteurized. The retail price of milk is 5 cents per quart throughout the year. The milk from one "model dairy" is sold for 6 cents per quart. Milk is sent in from 16 dairy farms, all within 1½ miles of the city.

The city exercises no supervision over its milk supply.

Oshkosh. (Population, 28,284.)

No reply to inquiries was received.

Greenbay. (Population, 18,684.)

[For comparison with other cities in Class IV, see p. 42.]

F. H. Thibodo, health officer.

The daily consumption of milk is estimated as 600 gallons, or 0.26 pint per capita, besides 60 gallons of cream. In explanation of this apparently low consumption it is stated that a great many families keep their own cows, and the milk from these is not included in the above estimate. Milk is sold from 1 store and 28 wagons. Several dairymen deliver milk in glass bottles, and these are filled at the farms. The retail price is 5 cents per quart throughout the year, producers receiving 3 cents. There are no "model dairies" near the city. Within the city limits there are 8 herds, including 120 cows, and milk is brought in wagons as far as 8 miles.

Ordinance of June, 1894, and board of health rules, March, 1894, sections 10 to 17, refer to milk. License fee for the sale of milk is $2, but persons keeping 1 or 2 cows in the city are exempt. Delivery wagons must be covered from April 1 to December 1. Impure, adulterated, etc., milk is prohibited. The standard is 12 per cent solids, 9 per cent solids not fat. Skimmed milk must be labeled and contain 9 per cent solids not fat. Cows must be given wholesome food and water. Employees must be free from contagious disease. Dairy premises and apparatus must be kept clean. Milk tickets must not be taken from a place where a contagious disease exists.

The health department has supervision over the milk supply. During the past year 12 samples of milk were examined by lactometer and Babcock test and doubtful samples by gravimetric analysis; no bacteriological examinations were made; all the city herds and 20 dairy farms were inspected.

Recent improvement in the quality of the milk is due to a better grade of cows.

Marinette. (Population, 16,195.)

[For comparison with other cities in Class IV, see p. 42.]

T. J. Redelings, health commissioner.

The daily consumption of milk is estimated as 464 gallons, or 0.23 pint per capita, besides 12 gallons of cream. In explanation of this low consumption of milk it is stated that about 200 cows are kept by private families, and the milk from these is not included in the above estimate. Milk is sold from 3 stores and 23 wagons. Very little of it is delivered in glass bottles, and these are filled at the farms. Some families pasteurize their own milk supply. The retail price of milk is 5 cents per quart in summer and 6 cents in winter, producers selling their own product. There are no "model dairies" near the city. Within the city there are 8 herds, including 105 cows, and milk is sent in from 15 dairy farms (237 cows). About one-tenth of the supply is received by railway, the longest shipment being 96 miles.

Ordinance No. 117, July, 1901, having 26 sections, refers to milk. License fee for the sale of milk or cream is $1 for each wagon, store, etc.; each wagon after the first, $1. Licenses are issued only after the health commissioner is satisfied with the sanitary conditions of the dairy premises. Impure, adulterated, etc., milk is prohibited. The milk standard is 12 per cent solids, 9 per cent solids not fat. Skimmed milk must be labeled and contain 9 per cent solids not fat. Sour milk must be labeled. Milk vehicles must be covered from April 1 to December 1. Stables must be whitewashed once a year. Cows must be fed upon wholesome food and be given pure water; be inspected in January, July, and September of each year; and every April they must be tested with tuberculin. The ordinance includes 15 rules regarding the management of dairies. Milk tickets must not be taken from places where there is a contagious disease, and the commutation, or punch, ticket must be used.

The health commissioner supervises the milk supply. During the past year 82 samples were examined by lactometer and Babcock test. No bacteriological examinations were made. All the city herds and all the dairy farms were inspected. Of 105 cows voluntarily subjected to the tuberculin test, 6 reacted and were killed by State officers.

Recent improvement is due to cleanliness at stables and the prompt cooling of milk. Needed improvements as given include the establishment of sterilizing stations for all milk, the use of the tuberculin test for all cows, and the spreading of information relating to the care of dairies.

Waukesha. (Population, 7,419.)

[For comparison with other cities in Class IV, see p. 42.]

Hugo Philler, M. D., health commissioner.

The daily consumption of milk is estimated as 395 gallons, or an average of 0.43 pint per capita. Milk is sold from 15 wagons, and about one-fifth of it is delivered in glass bottles. Very little milk is pasteurized, and the practice is not increasing. The retail price is 6 cents per quart throughout the year. Within the city limits there are 2 herds, including 40 cows, and milk is sent in from 13 dairy farms within 3 miles of the city limits.

About $150 is expended annually toward the supervision of the milk supply as the salary to the health commissioner. During the past year 350 samples of milk were examined by lactometer and Babcock test, special attention being given to preservatives; and 3 samples were examined bacteriologically for tubercle bacilli.

WYOMING.

Revised statutes, 1899, sections 2644, 5109, and 5110, refer to milk and foods. Milk is exempted from the list of articles that can not be sold on Sundays. The adulteration of any article of food or drink with fraudulent intent or sale of same or knowingly selling any unwholesome article of food or drink is a misdemeanor.

APPENDIX I.

The following are the milk ordinances entire of six cities, and miscellaneous selected sections from numerous others:

New York City.

The following are sections from the Sanitary Code, and regulations and rules as published by the board of health of the city of New York:

EXTRACT FROM SANITARY CODE OF LAWS GOVERNING THE SALE OF MILK.

SECTION 59. That no person shall have at any place where milk, butter, or cheese is kept for sale, nor shall at any place, sell, deliver, or offer, or have for sale, or keep for use, nor shall any person bring or send to said city any unwholesome, skimmed, watered, or adulterated milk, or milk known as "swill milk," or milk from cows or other animals that for the most part have been kept in stables or that have been fed in whole or in part on swill, or milk from sick or diseased cows or other animals, or any butter or cheese made from any such milk, or any unwholesome butter or cheese.

SEC. 63. No milk which has been watered, adulterated, reduced, or changed in any respect by the addition of water, or other substance, or by the removal of cream, shall be brought into, held, kept, or offered for sale at any place in the city of New York, nor shall anyone keep, have, or offer for sale in the said city any such milk.

The term "adulterated," when so used in this section, means:

First. Milk containing more than 88 per cent of water or fluids.

Second. Milk containing less than 12 per cent of milk solids.

Third. Milk containing less than 3 per cent of fats.

Fourth. Milk drawn from animals within fifteen days before or five days after parturition.

Fifth. Milk drawn from animals fed on distillery waste, or any substance in a state of fermentation or putrefaction, or on any unhealthy food.

Sixth. Milk drawn from cows kept in a crowded or unhealthy condition.

Seventh. Milk from which any part of the cream has been removed.

Eighth. Milk which has been adulterated with water or any other fluid, or to which has been added, or into which has been introduced, any foreign substance whatever.

SEC. 64. Any milk found to be adulterated, either by the addition of water or other substances, or by the removal of cream, or which has been brought into, or is held or offered for sale in the city of New York contrary to the provisions of section 63 of the Sanitary Code, may be seized and destroyed by any inspector, or other officer of this department authorized to inspect milk.

SEC. 65. No condensed milk which is adulterated shall be brought into, held, kept, or offered for sale at any place in the city of New York, nor shall anyone have, keep, or offer for sale in said city any such condensed milk. The words "condensed milk" mean pure milk from which any part of the water has been removed, or pure milk from which any part of the water has been removed and to which sugars have been added. The term "adulterated," when used in this section, refers to condensed milk in which the amount of fat is less than 25 per cent of the milk solids contained therein, or to which any foreign substance whatever has been added, excepting sugars, as in preserved milks.

SEC. 66. No milk shall be received, held, kept, offered for sale, or delivered in the city of New York without a permit in writing from the board of health and subject to the conditions thereof.

SEC. 67. No cream that is adulterated shall be brought into, held, kept, or offered for sale in the city of New York, nor shall anyone keep, have, or offer for sale in said city any such cream. The term "cream" means the fatty portions of pure milk which rise to the surface when the milk is left at rest, or which is separated by other means. The term "adulterated," when used in this section, refers to cream to which any foreign substance whatever has been added.

REGULATIONS.

(1) Milk shall not be kept for sale or stored in any room used for sleeping or domestic purposes or opening into the same.

(2) Milk must not be transferred from cans to bottles or other vessels on streets or on ferries or at depots, except when transferred to vessel of purchaser at time of delivery.

(3) Milk shall not be sold in bottles except under the following rules:

Bottles must be washed clean with a hot water solution of soap, or soda, or some other alkali, and then with hot water before filling with milk.

Bottles must not be filled except at the dairy or creamery, and in the city only in rooms so situated as to prevent the contamination of the milk by dust from the streets or other impurities.

Bottles must not be washed or filled with milk in any room used for sleeping or domestic purposes or opening into the same.

(4) The vessel in which milk is kept for sale must be so protected by means of a suitable cover or covered receptacle and so placed in the store as to prevent dust from the street or other impurities falling into it.

(5) Store permits must be posted in stores so that they can be easily seen at all times.

(6) Wagon permits to be carried on the wagons at all times when engaged in the sale, transportation, or delivery of milk.

(7) The number of wagon and the number of permit, the latter to be preceded by the words "Department of Health Permit," must be painted on both sides of the wagon in letters 2 inches in length and one-half inch in width, and in some contrasting color to that of the wagon.

(8) If any changes are made in the information given on application blank, the department must be immediately notified.

RULES FOR HANDLING AND KEEPING MILK.

(1) Milk should be kept in some place where dust and other impurities can not fall into it, such as a box with tight-fitting cover—preferably an ice box.

(2) The milk should be kept at as low a temperature as possible, not above 50° F.

(3) After the day's sales are over, the measures and utensils used in the sale of milk should be thoroughly cleaned with boiling water, to which a small amount of soda has been added in the proportion of one tablespoonful of washing soda to a gallon of water.

(4) The overflow pipe from the ice box in which the milk is kept must not be connected directly with the drainpipe or sewer, but must discharge into an open, water-supplied, properly-trapped, sewer-connected sink. (See section 41 of the Sanitary Code.)

(5) The ice box in which the milk is kept should be cleaned, by scrubbing out with hot soda solution made as in No. 3, at least twice a week.

(6) In selling milk, stir up the contents of the can thoroughly before measuring out the amount desired. This will prevent unintentional skimming. In this way the last quart of milk sold from the can will contain as much cream as the first quart sold.

(7) It sometimes happens that in cold weather the milk may be delivered to the dealer more or less frozen. If such is the case, detach the ice from the side of the can and gently heat the contents until the ice is all melted. If there is much ice in the can it is absolutely necessary to do this before selling the milk, otherwise the liquid part dipped out and sold at first will contain more of the solid part of the milk and cream, while the ice remaining and consisting principally of water will after a time melt, and the result will be milk containing more water than pure milk, and this might be enough to appear as though the milk had been adulterated with water.

(8) Do not place ice in the milk if it is desired to cool it or keep it cold, as the ice will melt and you will then have adulterated the milk with water.

City of Washington, D. C.

REGULATIONS FOR THE GOVERNMENT OF DAIRIES AND DAIRY FARMS.

OFFICE COMMISSIONERS OF THE DISTRICT OF COLUMBIA,
Washington, July 31, 1897.

Ordered, That the following regulations made by the health officer of the District of Columbia, pursuant to the requirements of section 11 of "An act to regulate the sale of milk in the District of Columbia, and for other purposes," approved March 2, 1895, in lieu of the regulations on the same subject made and approved June 26, 1895, are hereby approved:

SECTION 1. No building or space shall be used for dairy purposes which is not well lighted and ventilated, which is not provided with a suitable floor, and, if such room or space be a cellar or subcellar, or be located in a cellar or subcellar, which is not properly concreted, guttered, and drained.

SEC. 2. No dairy shall be located or maintained within any kitchen, wash room, work shop, or inhabited room, nor in proximity to any water-closet, privy, cesspool or urinal, nor in any room or space which is not of such size and construction as to permit the entire separation of all milk and milk products, both in the process of handling and storing the same, from all probable sources of contamination, either by dirt, noxious gases, infective organisms, or substances or anything liable to alter unnecessarily the quality of such milk or milk products.

SEC. 3. Every person maintaining a dairy shall provide for the use thereof, and shall use, a sufficient number of receptacles, made of nonabsorbent material, for the reception, storage, and delivery of milk, and shall cause them to be kept clean and wholesome at all times; and having delivered any such receptacle to a consumer shall not again use the same for the reception, storage, or delivery of milk or cream in any form until it has been, to his personal knowledge, properly cleaned after such use.

SEC. 4. Every person maintaining a dairy shall provide for the use thereof a supply of pure and suitable water, sufficient for the proper washing of all cans, bottles, and appliances.

SEC. 5. Every person maintaining a dairy shall keep the same and all appurtenances thereto clean and wholesome at all times, and shall change the water in the coolers at least once each day.

SEC. 6. No building shall he used for stabling cows for dairy purposes which is not well lighted, ventilated, drained, and constructed, or which is not provided with stalls or with proper stanchions for anchoring the cows so arranged as to allow not less than three and one-half feet width of space for each milch cow; or which is not provided with good and sufficient facilities for feeding the animals in a cleanly manner; or which contains less than six hundred cubic feet clear space for each cow, unless the use of such building for stabling cows for dairy purposes has been authorized prior to the promulgation of these regulations, in which case it shall contain not less than five hundred cubic feet clear air space for each cow.

SEC. 7. No room shall be used for stabling cows for dairy purposes which contains any water-closet, privy, cesspool, urinal, or manure pit; nor shall any fowl, hog, horse, sheep, or goat be kept in any room used therefor.

SEC. 8. Every person using any premises for keeping cows for dairy purposes shall, when so directed by the health officer, erect and maintain in the stable, stall, shed, or yard connected therewith one or more proper receptacles for drinking water for such cows, and shall keep the same supplied with clean, fresh water and none other.

SEC. 9. Every person using any premises for keeping cows for dairy purposes shall keep the entire premises clean and in good repair and the buildings well painted or whitewashed.

SEC. 10. Every person using any premises for keeping cows for dairy purposes shall cause the dung to be removed from the stables at least twice daily, and always within one hour preceding every milking of the cows; and shall not allow any accumulation of dung within the building occupied by the cows, but shall, whenever in the opinion of the health officer it is required by local conditions and surroundings, provide temporary storage for the same and for other refuse in a separate place, which shall be covered, and which, when so ordered by said health officer, shall be a water-tight receptacle.

SEC. 11. Every person keeping cows for dairy purposes within the city of Washington or its more densely populated suburbs, or elsewhere in the District of Columbia, if, in the opinion of the health officer, local conditions require it, shall cause the inclosure in which such cows are kept to be graded and drained so as to keep the surface reasonably dry and to prevent the accumulation of water therein, except as may be permitted for the purpose of supplying drinking water; and shall not permit any garbage, urine, fecal matter or similar substance to be placed or to remain in such inclosure, nor any open drain to run through it.

SEC. 12. Every person keeping cows for the production of milk for sale shall cause them to be kept clean and wholesome at all times, and shall cause the teats, and, if necessary, the udder, to be carefully cleaned by brushing, washing, or wiping before milking, and shall cause each such cow to be properly fed and watered.

SEC. 13. Any person using any premises for keeping cows for dairy purposes shall provide and use a sufficient number of receptacles, of nonabsorbent material, for the reception, storage, and delivery of milk, and shall keep them clean and wholesome at all times, and at milking time shall remove each receptacle, as soon as filled, from the stable or room in which the cows are kept; nor shall any milk or cream be stored or kept within any room used for stabling cows or other domestic animals.

SEC. 14. It shall be the duty of every person having charge or control of any premises upon which cows are kept to notify the health officer of the District of Columbia of the existence of any contagious or infectious disease among such cows, by letter delivered or mailed, within twenty-four hours after the discovery thereof, and to thoroughly isolate any cow or cows so diseased or which may reasonably be believed to be infected, and to exercise such other precautions as may be directed, in writing, by said health officer.

SEC. 15. Milkers and those engaged in the handling of milk or cream shall maintain strict cleanliness of their hands and persons while milking and while so engaged. It shall be the duty of every person holding a permit to maintain a dairy or dairy farm to enforce this regulation in reference to such persons as may assist them in the maintenance thereof.

SEC. 16. That any person violating any of the foregoing regulations shall, on conviction thereof in the police court, be punished by a fine of not more than ten dollars for each and every such offense, to be collected as other fines and penalties are collected.

SEC. 17. That the regulations for the government of dairies or dairy farms in the District of Columbia promulgated June 26, 1895, are hereby repealed.[a]

Louisville, Ky.

Be it ordained by the general council of the city of Louisville:

SECTION 1. That no person shall bring or send into the city for sale any milk without a permit to do so from the health officer, said permit to be furnished gratuitously by the health officer to all applicants, and to be renewed in the month of January of each year to be valid.

SEC. 2. All milk wagons shall have the name of the owner and the number of the wagon or vehicle painted thereon plainly and legibly.

SEC. 3. All grocers, bakers, and other persons having or offering for sale milk shall at all times keep the name or names of the dairyman or dairy company from whom the milk for sale was obtained posted up in a conspicuous place wherever such milk may be sold or kept for sale.

SEC. 4. No milk which is unwholesome or which has been watered, adulterated, reduced, or changed in any respect by the addition of water or other substance, or by the removal of cream, shall be brought into, held, kept, or offered for sale at any place in the city of Louisville, nor shall anyone keep, have, or offer for sale in the said city any such milk, except as provided for in this ordinance.

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[a] The milk and food laws of the District of Columbia are published in full on pages 576–581 of the Fourteenth Annual Report of the Bureau of Animal Industry.

SEC. 5. The terms "adulterated or unwholesome," as used in this ordinance, are held to mean in this ordinance:

First. Milk containing more than 88 per centum of water or fluids.

Second. Milk containing less than 12 per centum of milk solids.

Third. Milk containing less than 3 per centum of fats or having a specific gravity of less than 1.029.

Fourth. Milk drawn from animals within fifteen days before or ten days after parturition.

Fifth. Milk drawn from animals fed on distillery waste, or any substance in a state of fermentation or putrefaction, or on any unhealthy food or drink.

Sixth. Milk drawn from cows kept in a crowded or unhealthy condition.

Seventh. Milk from which any part of the cream has been removed.

Eighth. Milk which has been adulterated with water, or any other fluid, or to which has been added, or into which has been introduced, any foreign substance whatever.

Ninth. Cream sold or offered or kept for sale as such must contain at least 20 per centum butter fat.

SEC. 6. No dealer in milk, by himself or his agents, shall sell, or have in his possession with intent to sell, milk from which cream has been removed in part or in whole, unless sold as skimmed milk, and unless there shall appear in a conspicuous place on both sides of the vehicle from which such milk is sold the words "Skimmed milk," distinctly and legibly made in letters not less than 1 inch in height; nor shall any dealer in milk, nor his agent or agents, sell as skimmed milk any milk which has a less percentage of casein and salts than that contained in unskimmed milk.

SEC. 7. Every dealer in milk selling such skimmed milk shall, on each and every vessel from which he sells, have attached in front and side a notice stating in legible letters that such skimmed milk is for sale.

SEC. 8. Any person who offers for sale milk, skimmed or unskimmed, in the city of Louisville, whether a resident or nonresident, shall furnish a sample of such milk to any officer representing the health department of the city of Louisville who may request the same for the purpose of examination or analysis.

SEC. 9. No dealer in milk, or his agents, shall serve milk in bottles to any dwelling or other house that has in it any contagious disease or diseases, or that is placarded by the health officer for contagious disease or diseases, until said placard has been removed by the proper authorities; nor shall any person remove from such dwelling or house any bottle or receptacle which has been or is used for the purpose of receiving or storing milk. No person suffering from, or who has knowingly, within a period of twenty days, been exposed to, diphtheria, scarlet fever, erysipelas, smallpox, or other dangerous contagious disease, shall work or assist in or about any dairy or dairy farm; no proprietor, manager, or superintendent of any dairy or dairy farm who supplies milk to the citizens of Louisville, Ky., shall knowingly permit any person suffering, or exposed as aforesaid, to work or assist in or about said dairy or dairy farm.

SEC. 10. The health officer shall not issue a permit to any person to sell milk in the city of Louisville who does not furnish once in every three months the health department with a certificate from a duly qualified veterinary surgeon to the effect that the cattle from which the milk he proposes to sell is obtained are entirely free from disease, and said certificates shall be kept on file in the health department, and shall embrace a descriptive enumeration of the cattle examined. The health officer may require the tuberculin test if any herd is suspected of infection with tuberculosis.

SEC. 11. Every person maintaining a dairy shall keep the same and all appurtenances thereto clean and wholesome at all times, and shall change the water in the coolers at least once in each day, and no building or space shall be used for dairy purposes which is not well lighted and ventilated and which is not provided with a suitable floor and properly drained, or which contains less than 600 cubic feet clear space for each cow.

SEC. 12. Every person using premises for keeping cows for dairy purposes shall keep the entire premises clean and in good repair and the buildings well painted or whitewashed, and no accumulation of dung shall be allowed, but shall be removed at least twice daily, and one hour preceding every milking of the cows.

SEC. 13. Milkers and those engaged in the handling of milk or cream shall maintain strict cleanliness of their hands and persons while milking or while so engaged.

SEC. 14. Every person keeping cows for the production of milk for sale shall cause them to be kept clean and wholesome at all times, and shall cause the teats, and, if necessary, the udder, to be carefully cleaned by brushing, washing, or wiping before milking, and shall cause each of such cows to be properly fed and watered.

SEC. 15. Any person using any premises for keeping cows for dairy purposes shall provide and use a sufficient number of receptacles of nonabsorbent material for the reception, storage, and delivery of milk, and shall keep them clean and wholesome at all times, and at milking time shall remove each receptacle as soon as filled from the stable or room in which the cows are kept; nor shall any milk or cream be stored or kept within any room used for stabling cows or other domestic animals.

SEC. 16. It shall be the duty of every person having charge or control of any premises upon which cows are kept to notify the health officer of the city of Louisville, of the existence of any contagious or infectious disease among such cows, by letter delivered or mailed within twenty-four hours after the discovery thereof, and to thoroughly isolate any cow or cows so diseased, or which he may reasonably believe to be infected, and to exercise such other precautions as may be directed, in writing, by said health officer.

SEC. 17. All dairies from which milk is offered for sale in the city of Louisville shall be open at all times to the inspection of the health officer of the city of Louisville, or any officer representing him.

SEC. 18. That any person, firm, company, or corporation who shall violate any of the provisions of this ordinance shall be fined for each offense not less than $20 nor exceeding $100.

SEC. 19. This ordinance shall take effect from and after its passage.

Indianapolis, Ind.

RULES AND REGULATIONS FOR THE CARE AND MANAGEMENT OF DAIRIES ADOPTED BY THE BOARD OF PUBLIC HEALTH AND CHARITIES.

(1) No building shall be used for stabling cows for dairy purposes which is not well lighted, ventilated, drained, and constructed.

(2) No building shall be used for stabling cows for dairy purposes which is not provided with a suitable floor, laid with proper grades and channels to carry off all drainage. If a public sewer abuts the premises upon which such buildings are situated, they shall be connected therewith and furnished with proper sanitary traps.

(3) No building shall be used for stabling cows for dairy purposes which is not provided with good and sufficient feeding troughs or boxes, and with a covered water-tight receptacle outside the building for the reception of dung or other refuse.

(4) No water-closet, privy, cesspool, urinal, inhabited room, or workshop shall be located within any building or shed used for stabling cows for dairy purposes or for the storage of milk or cream; nor shall any fowl, hog, horse, sheep, or goat be kept in any room used for such purpose.

(5) No space in buildings or sheds used for stabling cows shall be less than 500 cubic feet for each cow, and the stalls therefor shall not be less than 4 feet in width.

(6) It shall be the duty of each person using any premises for keeping cows for dairy purposes to keep such premises thoroughly clean and in good repair and well painted or whitewashed at all times.

(7) It shall be the duty of each person using any premises for keeping cows for dairy purposes to cause the building in which cows are kept to be thoroughly cleaned and to remove all dung from the premises, so as to prevent its accumulation in great quantities.

(8) Every person keeping cows for the production of milk for sale shall cause every cow to be cleaned every day and to be properly fed and watered.

(9) Every person using any premises for keeping cows shall cause the yard used in connection therewith to be provided with a proper receptacle for drinking water for such cows; none but fresh, clean water to be used in such receptacle.

(10) Any inclosure in which cows are kept shall be graded and drained so as to keep the surface reasonably dry and to prevent the accumulation of water therein, except as may be permitted for the purpose of supplying drinking water; no garbage, urine, fecal matter, or similar substances shall be placed or allowed to remain in such inclosure, and no open drain shall be allowed to run through it.

(11) Any person using any premises for keeping cows for dairy purposes shall provide and use a sufficient number of receptacles, made of nonabsorbent materials, for the reception, storage, and delivery of milk, and shall cause all milk to be removed without delay from the room in which the cows are kept.

(12) No milk shall be kept in ice boxes or refrigerators which are in any way connected with sewers or cesspools, nor shall any milk be kept in the same compartment of any ice box or refrigerator in which meats or other articles of food are kept.

(13) All cans, measures, and other receptacles for milk shall be scalded with boiling water or live steam daily; they must not be rinsed in cold water before using, for the water may not be pure, and some of it remaining in the vessels may contaminate the milk. All milk cans coming from dairies to dealers must be properly cleaned as above before returning to producer, thoroughly aired, and kept turned upside down in a cool place.

(14) All milk shall be strained through wire-cloth strainers and shall be cooled to 58° within forty-five minutes after it is drawn from the cow. In winter weather said cooler shall be guarded against freezing. The milk shall not exceed 60° when delivered to the consumer or dealer.

(15) All milk cans delivered to creameries or dealers in the city shall be covered with air-tight lids, and when conveyed in open wagons shall be covered with canvas while being so conveyed; said canvas to be kept clean by frequent washing.

(16) All stripping, as well as first part of milk, shall be delivered. The night's and morning's milk shall not be mixed. No milk shall be delivered that is taken from a cow that has calved within twelve days or from a cow that will come in or calve inside of sixty days.

(17) Cows shall not be fed on feed which will impart a disagreeable flavor to milk or upon any food which will not produce milk of a standard richness, or any sour, damaged feed or ensilage.

(18) It shall be the duty of any person having charge or control of any premises upon which cows are kept to notify the secretary of the board of health of the existence of any contagious or infectious disease among such cows immediately upon the discovery thereof, and to thoroughly isolate any cow or cows affected, and to exercise such other precautions as may be directed, in writing, by the said secretary.

(19) It shall be the duty of any person owning or having control of cows used for the production of milk for sale or exchange to submit said cows to the tuberculin test for tuberculosis on the written order of the secretary of the board of health.

(20) It shall be the duty of any person having charge or control of any premises upon which milk or cream is produced, handled, stored, or distributed to notify the secretary of the board of health immediately upon the discovery of any case of

Asiatic cholera, croup, diphtheria, measles, membranous croup, scarlet fever, smallpox, typhoid fever, typhus fever, or any other contagious or infectious diseases upon such premises. No milk or cream shall be sold, exchanged, given away, or in any other manner distributed from such infectious premises until all danger of spread of disease shall be removed and the secretary certifies to that effect. No person who attends cows or milks them, or who has the care or handling of vessels for the sale, storage, or distribution of milk or cream, shall enter any place or premises wherein exists any of the diseases mentioned herein; nor shall any such have any communication, direct or indirect, with any person who resides in or is an occupant of such infected place. Strict cleanliness of the hands and person of milkers and those engaged in the handling of milk or cream, and of the bodies of cows, especially of the udders and teats, must be enforced at all times, to the end that no impurity or foreign substance may be added to the milk or cream, such addition being declared adulteration by the statute.

(21) No person shall add water or any other foreign substances to milk or cream offered or intended for sale or exchange. Milk offered for sale as whole milk or sold as such which contains more than 87 per cent of watery fluid or less than 13 per cent of milk solids, including 3.7 per cent of butter fat,[a] is prima facie watered, and such watering is declared an adulteration by the ordinance, the punishment for which is a fine of not less than $25 for each and every offense.

Memphis, Tenn.

MILK ORDINANCE.[b]

Be it ordained by the legislative council of the city of Memphis, That—

SECTION 1. No milk, buttermilk, or cream, or other dairy products shall be received, held, kept, offered for sale, or delivered in the city of Memphis without [the dealer] first obtaining a permit in writing from the board of health, and subject to the conditions thereof.

SEC. 2. No person shall have at any place, sell, deliver, or offer for sale, or keep for use, or bring or send to said city, milk or other dairy products which are unwholesome or adulterated with any substance, or from diseased animals, or from animals which are kept in uncleanly and unsanitary stables or stable yards, or from animals which are fed on distillery waste or other unwholesome food, or watered with polluted water, or from dairy farms or other places where attendants are affected with or exposed to contagious or infectious diseases.

SEC. 3. Milk shall be termed unwholesome—

(*a*) When drawn from animals within fifteen days before or five days after parturition.

(*b*) When drawn from animals fed on distillery or other unhealthy food or watered with polluted water.

(*c*) When drawn from animals kept in a crowded or in unhealthy conditions.

(*d*) When obtained from dairy farms or other places where attendants are affected with or exposed to contagious or infectious diseases.

SEC. 4. Milk shall be termed adulterated—

(*a*) When it contains more than 88 per cent of water or other fluid.

(*b*) When it contains less than 12 per cent of milk solids.

(*c*) When it contains less than 3 per cent of fats.

(*d*) When water, or antiseptic, or other substance has been added.

(*e*) When any part of the cream has been removed.

(*f*) When placed in containers which are dirty or have been washed with polluted water.

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[a] The milk standard has been lowered by a State law to 12 per cent solids, 3 per cent fat.—H. E. A.

[b] This ordinance is printed on the reverse side of the milk license.

SEC. 5. It shall be the duty of the sanitary officers to obtain samples of milk, buttermilk, or cream from milk dealers whenever requested to by any citizen or ordered to do so by the board of health; said samples, together with name and address of dealers or drivers, are to be sent to the city chemist for analysis.

SEC. 6. All wagons shall have painted thereon, in plain, legible manner, the name of the dairy or owner thereof and the number of the wagon; and anyone selling or offering for sale milk, cream, or buttermilk without having a permit, as provided for herein, or selling or offering for sale milk, cream, or buttermilk, or other dairy product which is unwholesome or adulterated, or in any way violating, as a whole or in part, the provisions of this ordinance within said city, shall be guilty of misdemeanor and subject the offenders to a fine of not less than $5 nor more than $50 for each and every offense.

This ordinance shall take effect from and after its passage.

Passed July 13, 1898.

Erie, Pa.

RULES AND REGULATIONS OF THE BOARD OF HEALTH CONCERNING THE MILK SUPPLY.

SECTION 1. No person or persons shall sell milk or cream in the city of Erie without first, annually before the 1st day of July, registering with the board of health his or their name or names, together with the location of their route or place of business and the name of the owner of and the location of the dairy from which they obtain said milk or cream, and obtaining from the board a permit to carry on such business, which permit shall be issued without charge and shall be displayed in every store or wagon from which said milk or cream is sold.

SEC. 2. Every person or persons peddling milk or cream in the city of Erie shall have the wagon or other vehicle from which milk is sold inclosed and conspicuously marked with his, her, or their names and the locality from which said milk or cream is obtained.

SEC. 3. No milk shall be sold, offered for sale, or distributed in the city of Erie unless the cows from which it is obtained have within one year been examined by a competent veterinarian and shown to the satisfaction of the board of health to be free from disease; but this does not necessarily mean that the tuberculin test must be employed.

SEC. 4. The quality of milk or cream offered for sale in this city shall be the same as is provided for by act of assembly, and skimmed milk shall not be sold except in the manner prescribed by such act.

SEC. 5. No milk or cream shall be sold by any person or persons in whose family or residence there is a case of contagious or infectious disease or from any dairy in the vicinity of which there is such disease, except by permission of and in the manner prescribed by the board.

SEC. 6. No milk shall be sold or exposed for sale in the city of Erie except milk sold from cows stabled under light, dry, and well-ventilated conditions, and in all other respects conforming to the requirements set forth in the following rules:

Rule 1. Each cow shall have at least 3 feet in width of floor space when fastened in stanchions, and, in all cases where no adequate artificial means for ventilation are provided, each animal shall have an air space of at least 500 cubic feet.

Rule 2. All stables for shelter of said cattle shall be provided with a tight, dry floor. The manure drop shall be water-tight, and if constructed of wood shall be asphalted, tarred, or otherwise made nonabsorbent.

Rule 3. The walls and ceilings of said stables shall be whitewashed whenever it may be deemed necessary by the board of health.

Rule 4. Manure shall not be allowed to accumulate in large quantities in stable yards nor near the buildings where the cattle are kept, and when stored temporarily in such places it shall be removed at least once a month to a distance of at least 10 feet from said stable. The stable yards shall be drained and kept in a clean, dry condition, and no accumulation of household garbage, vegetables, or other putrescible matter shall be allowed to remain or decay in said stable yards.

Rule 5. Cattle shall at all times be kept in a clean condition, and udders shall be washed, hand-rubbed or wiped with a clean, damp cloth before each milking.

Rule 6. No milk shall be sold or offered for sale or distributed in the city of Erie obtained from any cow that has calved within five days, or from a cow which will come in or calve within sixty days.

Sec. 7. No milk shall be sold or exposed for sale in the city of Erie except milk obtained from cattle fed and watered under the following conditions: All food given to such cattle shall be good and wholesome. Water supplied to cattle shall be pure and free from all contamination by stable or household drainage.

Sec. 8. All milkers and other attendants employed in any dairy the milk from which is to be sold or offered for sale or delivered in the city of Erie shall be personally clean. Before milking or caring for the milk hands shall be washed and clothes changed or brushed, and no milk shall be delivered or sold or exposed for sale in said city produced from dairies wherein the foregoing regulations are not observed.

Sec. 9. No milk shall be kept for sale or distribution or handled, transferred from can, or stored in any stable or similar place, or in any room used wholly or in part for domestic or sleeping purposes.

Sec. 10. Milk shall be stored or regularly mixed, cooled, or poured from can to can only in a room not directly connected with a stable or stables, provided with a tight floor, and kept constantly neat and clean, the walls of the room being of such a nature as to allow easy and thorough cleaning.

Sec. 11. No animal, water-closet, or privy shall be in the aforesaid room or in any room connected directly therewith.

Sec. 12. Whenever milk is filtered or strained, cooled, or stored in a room, said room shall be such as is described in sections 9 and 10.

Sec. 13. Milk kept for sale in any store, shop, market, bakery, or other establishment shall be always kept in a covered cooler, box, or refrigerator, properly drained and cared for; and while therein shall be tightly corked or closed, and only in such location and under such conditions as shall be approved by the board of health.

Sec. 14. All vehicles from which milk or cream is sold in this city shall, during the months of June, July, August, and September, be equipped with ice boxes, which shall be kept clean and which shall be of sufficient size.

Sec. 15. All cans, bottles, or vessels of any sort used in the sale, delivery, or distribution of milk to the consumer must be cleaned and sterilized (boiled, baked, scalded, or steamed) by the milk dealer before they are again used for the same purpose.

Sec. 16. No metallic or card ticket shall be used in connection with the sale or distribution of milk in the city of Erie, but instead thereof a coupon ticket shall be employed, and such ticket shall be canceled and destroyed after being once used.

Sec. 17. Under no circumstances shall a milk dealer in the city of Erie, or his or her employee, take from a quarantined house any money, can, bottle, etc., or enter such a house for any purpose whatever without written permission from the board of health.

Montclair, N. J.

AN ORDINANCE CONCERNING THE PRODUCTION OF MILK AND REGULATING ITS SALE.

Be it ordained by the board of health of the town of Montclair, in the county of Essex, as follows:

Section 1. Every person, corporation, or association of persons who now is or who hereafter shall be engaged in the sale or exposure for sale of milk within the town of Montclair, before selling or exposing the same for sale, shall furnish the board of health of the town of Montclair a true and complete statement as to the locality from which the milk so sold or exposed for sale is produced; also a full and complete list of the names and addresses of persons from whom the said milk is purchased, and the names and addresses of all persons to whom they are regularly selling or delivering milk within said town; said lists shall be furnished to the said board on the first days of January, April, July, and October of each calendar year, and at all other times when requested by the said board.

Sec. 2. No milk shall be sold or exposed for sale in the town of Montclair except milk from cows stabled under light, dry, and well-ventilated conditions, and in all other respects conforming to the requirements hereinafter set forth, viz:

(*a*) Each cow shall have at least 3 feet in width of floor space when fastened in stanchions, and in all cases where no adequate artificial means for ventilation are provided, each animal shall have an air space of at least 500 cubic feet.

(*b*) All stables for the shelter of said cattle shall be provided with a tight dry floor. The manure drop shall be water-tight, and if constructed of wood shall be asphalted, tarred, or otherwise made nonabsorbent.

(*c*) The walls and ceilings of said stables shall be whitewashed whenever it may be deemed necessary by this board of health.

(*d*) Manure shall not be allowed to accumulate in large quantities in stable yards nor near the buildings where the cattle are kept, and when stored temporarily in such places it shall be removed at least once per month. The said stable yards shall be drained and kept in a clean dry condition, and no accumulation of household garbage, vegetable, or other putrescible matter shall be allowed to remain or decay in said stable yards.

(*e*) Cattle shall at all times be kept in a clean condition, and udders shall be washed, hand rubbed, or wiped with a clean damp cloth before each milking.

(*f*) No milk shall be sold or offered for sale or distribution in the town of Montclair unless the cows from which it is obtained have within one year been examined by a competent veterinarian, and are free from diseases dangerous to the public health. But this shall not be construed as forbidding the sale or use of milk from cows not tested with tuberculin.

(*g*) No milk shall be sold or offered for sale or distributed in the town of Montclair obtained from any cow that has calved within ten days or from a cow which will come in or calve within sixty days.

Sec. 3. No milk shall be sold or exposed for sale in the town of Montclair except milk produced from cattle fed and watered under the following conditions: All food given to such cattle shall be fresh, sweet, and wholesome. The use of either distillery slops or fermented brewers' grains is prohibited, and their presence on any dairy premises will be considered sufficient cause for the exclusion of the milk from such dairy from sale or delivery in said town. Water supplied to cattle shall be pure and free from all contamination by stable or household drainage, and no well or spring in or adjoining any stable yard shall be used for watering said cattle.

Sec. 4. All milkers and other attendants employed in any dairy, the milk from which is to be sold or offered for sale or delivered in said town, shall be personally clean. Before entering upon their duties connected with the dairy, hands shall be washed, and clothes changed or brushed, and no milk shall be delivered or sold or exposed for sale in said town produced from dairies wherein the foregoing regulations are not enforced.

Sec. 5. Utensils used for the collection and transportation of milk shall, before being used, be thoroughly washed with pure water and soda or soap, and then sterilized by boiling or steaming.

Sec. 6. Milk which is to be delivered or sold or offered for sale in said town shall, immediately upon being drawn from the cow, be removed from the stable to a room separate and apart from the said stable, and immediately cooled by submerging the vessel in which the milk is contained in cool water to a depth equal to that of the said milk in the vessel. The above-mentioned room shall be properly ventilated and lighted and shall be used for no other purpose than that indicated above, and shall at all times be kept in a clean condition.

Sec. 7. The said milk shall be delivered in bottles unless permission for delivery in another manner shall be granted by said board. No tickets shall be used in connection with delivery of milk.

Sec. 8. If at any time any person or persons having any connection with a dairy from which milk is delivered or sold or offered for sale in the town of Montclair, or any resident member of the family of any person so situated, shall be stricken with cholera, smallpox (including varioloid), diphtheria, membranous croup, yellow, typhus, typhoid, or scarlet fever, measles, or any other communicable disease that may hereafter be declared by this board to be dangerous to the public health, notice shall be given to said board immediately by the owner or owners of such dairy, and no milk produced from the dairy of any corporation, person, or association of persons failing to give the notice herein required shall hereafter be sold or exposed for sale or delivered in the town of Montclair until special permission therefor has been granted by said board.

Sec. 9. Any person, corporation, or association of persons violating any of the provisions of this ordinance shall, on conviction thereof, be liable to a penalty of not less than $10 nor more than $100.

Sec. 10. All ordinances or parts of ordinances inconsistent with the provisions of this ordinance are hereby repealed.

Passed March 24, 1898.

Chicago, Ill.

ORDINANCE SECTIONS REGARDING QUALIFICATIONS, REQUIREMENTS, AND DUTIES OF MILK INSPECTION OFFICIALS.

Sec. 934. There shall be appointed by the commissioner of health a superintendent and an assistant superintendent of the milk and food division. They shall be persons skilled in the science of analytical chemistry and bacteriology, and, before entering upon their duties, shall each execute a bond to the city of Chicago in the sum of $5,000, with good and sufficient sureties to be approved by the mayor, conditioned for the faithful performance of the duties of their respective offices.

Sec. 936. There shall also be employed in the milk and food division of the department of health hereby created such assistants, employees, and inspectors as shall be deemed necessary by the commissioner of health, and they shall be under the direction of the superintendent and shall perform such duties as are in this article provided and as the said superintendent may additionally direct. The inspectors employed under this article shall give a good and sufficient bond to the city of Chicago in the sum of $2,000, to be approved by the mayor, and conditioned for the faithful performance of their duties.

ORDINANCE SECTION REFERRING TO SIGNS ON DELIVERY VEHICLES.

Sec. 943. No milk or cream shall be sold, offered for sale, exposed for sale, exchanged, delivered, transported, conveyed, or carried on any wagon, carriage, or other vehicle unless the owner or owners thereof shall first obtain from the city clerk two painted metal plates 8 inches long and 4 inches wide, on which shall be stamped the number corresponding to the license, and also the words "Chicago Milk Peddler," together with the year for which the license is issued, which plates the said licensed owner or owners shall cause to be securely fastened on the outside of each side of the box of his vehicle so licensed, or in a conspicuous place so that the same can be easily seen.

Grand Rapids, Mich.

ORDINANCE SECTION REGARDING MILK LICENSE FEES.

SEC. 2. Any person or persons desiring to sell, barter, or traffic in milk within the city of Grand Rapids, on his or their application to the city clerk of said city shall be licensed to do the same as hereinafter provided, and shall be granted a permit therefor upon the payment of the following license fee: For the selling of milk from wagons, $5 per year; from milk carts propelled by hand, $1 per year; from cans carried by hand, 50 cents per year; for selling from dairies or creameries, $5 per year; and for selling from private houses or restaurants and all other places, $1 per year: *Provided, however,* That where more than one milk wagon is owned, operated, and controlled by the same person or firm, that a license fee of $2 shall be charged for each additional wagon, which said sum shall be paid to the city clerk and by him paid to the city treasurer. Said license shall continue and be operative until the first Monday in May next ensuing the issuance of the same, unless sooner revoked as hereinafter provided, and the license fees above provided shall be the same for a full year or for any part thereof: *Provided, however,* That no fee shall be charged any farmer for such license or permit who does not sell any milk whatever except such as he produces from his own cows on his own farm.

Houston, Tex.

ORDINANCE SECTIONS DEFINING THE TERMS ADULTERATED, ETC., AND REFERRING TO MILK BROUGHT INTO THE CITY.

SEC. 15. The terms adulterated, impure, unhealthy, and unwholesome, applied to milk or dairy products, and as used in this ordinance, mean—

(1) Milk containing less than 12 per centum of milk solids.

(2) Milk containing more than 88 per centum of water or fluids.

(3) Milk containing less than 3.2 per centum of fats.

(4) Milk drawn from cows within fifteen days before or within five days after parturition.

(5) Milk drawn from cows fed on any unhealthy or unwholesome food.

(6) Milk drawn from cows kept in an unhealthy or unsanitary condition, or from cows affected with any form of disease, or from cows which are supplied with water which is impure or unwholesome.

(7) Milk from which any part of the cream has been removed.

(8) Milk which has been diluted with water or with any other fluid, or to which has been added or into which has been introduced any foreign substance whatever.

(9) Milk drawn from cows, or by milkers that are themselves, in a condition of filth or uncleanliness.

(10) Any milk which is shown by analysis to contain any substance or substances of any character whatsoever not natural or normal constituents of milk, or to have been deprived either wholly or in part of any constituent naturally or normally contained in milk.

SEC. 24. It shall be the duty of the owner or consignee of milk brought into the city of Houston by land over any road or railroad leading into the city of Houston to cause the same to be tendered and exposed for inspection according to the requirements of said health officer: *Provided,* That said milk shall not be detained for inspection for a longer period than one hour.

Fall River, Mass.

REGULATION 71, REFERRING TO SKIMMED MILK.

SEC. 4. Skimmed milk shall not be sold, exchanged, or delivered within the city of Fall River unless a special license therefor shall have been first obtained from the board of health, which will be granted only on conditions that the provisions of the public statutes shall be observed and that the words "Skimmed Milk," the name of the licensee, and the number of the special license shall be painted on both sides of the wagon or other vehicle or can or vessel used to convey or hold the milk, in letters and figures 2 inches in length and one-half inch in width and in some contrasting color to that of the wagon or can.

Fort Wayne, Ind.

ORDINANCE SECTION REGARDING DELIVERY OF SKIMMED MILK.

SEC. 6. No skimmed milk shall be sold, offered for sale, exchanged, delivered, transported, or carried in any wagon, carriage, or other vehicle unless the same is carried and contained in a can or vessel painted red, on which are conspicuously painted or printed the words "Skimmed Milk" in large, plain roman letters not less than 2 inches long.

Milwaukee, Wis.

ORDINANCE SECTION REQUIRING COVERING ON MILK DELIVERY VEHICLES.

SEC. 4. No person or persons shall bring to or deliver milk in the city of Milwaukee for the purpose of retailing the same to consumers in the city of Milwaukee in any open or uncovered wagon, cart, or conveyance of any kind; and all milk hereafter to be brought to the city of Milwaukee to be retailed to consumers, or for that purpose to be delivered in the city of Milwaukee, shall be brought to said city and delivered in cars, wagons, or carts so constructed that the covering hereinbefore provided for shall not come in contact with the cans or vessels containing the milk, and shall protect such milk and the cans or vessels containing the same from the sun and rain, and, as far as practicable, from the dust and all the impurities of the air.

Kansas City, Mo.

ORDINANCE SECTION REGARDING DAIRY INSPECTIONS.

SEC. 1033. *Examination of stables, lots, etc.* It shall be the duty of the sanitary sergeant and the policemen and city chemist to at least once every two months, and as much oftener as they think necessary and proper, inspect and examine all stables, lots, and pastures where cows are kept and fed whose milk or cream therefrom is sold in the city; as also the food such cows are fed, and the health and condition of such cows, and make report thereof to the sanitary superintendent. If in their opinion any such cows are not fed on good and wholesome food or are kept in an unhealthy and bad condition, or such stables and pastures are not properly cleaned and kept so, then they shall so notify, verbally or in writing, the owner or keeper of such cows, stables, and pastures and also the persons who sell or offer for sale the milk or cream therefrom in the city. And if any such owner, keeper, or person shall not at once cease to milk any cow in an unhealthy and bad condition, or shall refuse or neglect to at once proceed to clean such stables and pastures, the milk therefrom shall not be sold or offered for sale in the city until every objection thereto is abated and removed and kept so. Every person violating any provision in this section contained shall be deemed guilty of a misdemeanor and on conviction shall be punished by a fine of not less than $50 nor more than $500.

Rochester, N. Y.

ORDINANCE SECTION REGULATING THE NUMBER OF COWS TO BE KEPT IN THE CITY.

SECTION 1. No person, firm, or corporation shall keep or allow to be kept in any building or on any grounds or premises of which such person, firm, or corporation shall be the owner, lessee, or occupant, when such buildings, grounds, or premises are situated within the built-up portion of the city of Rochester, more cows than 1 to a city lot of 33 feet by 150 feet, or space equal thereto, and no person, firm, or corporation shall keep or allow to be kept in any building or on any premises, of which such person, firm, or corporation shall be the owner, lessee, or occupant, where such buildings or premises are situated in the outlying portions of the city, and where such premises are not subdivided into city lots or actually occupied as such, more than 15 cows to each acre of land owned or occupied by such person, firm, or corporation, without a permit from this department. Every permit issued under this ordinance shall be subject to the rules, regulations, or ordinances of this department and may be revoked at pleasure of the department.

San Francisco, Cal.

ORDINANCE SECTION CONCERNING CARRYING SWILL ON MILK DELIVERY VEHICLES.

SEC. 9. It shall be unlawful for any person or persons, firm, or corporation to have or carry on any wagon or vehicle upon or from which milk or cream is being or is brought, carried, stored, deposited, sold, exchanged, delivered, or distributed or offered or exposed for sale or distribution as food for any human being, any swill, garbage, refuse, or any decaying or fermenting, putrefying, foul, unwholesome, noxious, or filthy matter, or any cans or receptacles containing any material or substance with which cream or milk might be diluted, adulterated, or rendered impure, unwholesome, or unhealthy.

Denver, Colo.

ORDINANCE SECTION REGARDING NOTICE OF USE OF WATERED MILK.

SEC. 489. All pure milk shall be deemed to contain 12 per cent of milk solids, and any hotel, boarding house, or restaurant furnishing milk to their boarders, guests, or customers, or any of them, containing a less quantity of milk solids than 12 per cent, or a greater quantity of water than 88 per cent, shall cause to be posted and kept in a conspicuous place in the dining room where such milk is furnished for use a card with the words "Watered Milk" plainly printed thereon in large letters not less than 3 inches in length, so that the same may be plainly read from all parts of the room.

Malden, Mass.

ORDINANCE SECTION REQUIRING THE PUBLICATION OF NAMES OF VIOLATORS.

SEC. 5. The inspector shall cause the name and place of business of every person convicted of selling adultered milk or vinegar, or of having the same in his possession with intent to sell, to be published in two newspapers in the city or county.

APPENDIX II.

The following is a copy of instructions sent out by an enterprising Boston milk contractor to the dairymen from whom his milk is obtained. Such an effort on the part of milk dealers to induce the observance of proper methods in the production and handling of milk is most commendable. Numerous dealers throughout the country have adopted the same plan, using short original circulars similar to this one. In some cases, upon special request, the United States Department of Agriculture has mailed appropriate Farmers' Bulletins to list of names of milk producers furnished for this purpose by those who are receiving and selling milk in cities.

SUGGESTIONS AND RULES FOR DAIRYMEN SUPPLYING MILK FOR BOSTON, MASS.

Recent investigations of our milk supply have shown us the need of greater care on the part of the dairymen in the production of a cleaner and more sanitary milk. The following suggestions are those most necessary, and we earnestly hope will be carried out by you:

A. WHITEWASHING COW STABLES OR "TIE-UPS."

Whitewash acts as a mild antiseptic and adds greatly to the general cleanliness and healthfulness of the stable. It should be applied both fall and spring, and it is thought by the associated boards of health of Massachusetts that it should be required of all dairymen. It is gratifying to note that when whitewashing has been done in this way the farmers are very much pleased with the result.

B. ENSILAGE.

While ensilage is a very good food when fed in moderate quantities, there is a great tendency to feed too much of it and in that way injure the quality and flavor of the milk. It may be fed to the extent of one-half bushel per cow once a day directly after milking without injury to the milk.

Silos in the barn are unsanitary and fill the air with a very disagreeable odor. This is breathed by the cows, and is also absorbed by the milk, in that way injuring it permanently.

C. MILKING AND CARE OF MILK.

We call special attention to the fact that the cow's udder should be thoroughly cleansed by rubbing with a damp cloth previous to milking, as any loose dirt falling into the pail causes the milk to spoil quickly, even though it is strained out immediately afterwards, as half of it dissolves in the milk, and therefore can not be removed by straining. The milker's hands should also be *washed* and *dried* just previous to milking, and should never be wet with the milk, as is the custom at present in some dairies. Milk will keep better if the first teaspoonful or two from each teat be milked on the floor or otherwise rejected, as this milk always contains the germs that cause quick souring. If we could imagine a portion of the milk removed directly from the cow's udder into an absolutely clean can, and covered with absolutely clean cotton batting one-fourth inch thick or more, this milk not having come in contact with the dust of the air or dairy utensils, it would keep in this way in perfect condition for weeks. Milk should be removed from the cow stable as soon as drawn, and should then be strained preferably through clean flannel and cooled as soon as possible to 40° F. and held at that temperature, covered with a clean cloth until collected.

We again call attention to the fact that milk must be artificially cooled in winter

as well as summer by placing the cans in cold water. Metal strainers soldered into the pail are objectionable, as it is almost impossible to keep them clean. Flannel for straining should be wrung out of hot water just before using.

D. PAILS, CANS, AND STOPPLES.

We have found that, while a dairy in general may be clean and care taken with the milk, the latter sometimes fails to keep well. We have traced this trouble to pails, cans, and stopples. Milk pails should have all seams filled up flush with solder and should be thoroughly scalded, washed in strong suds both morning and night, and kept inverted until used for milking. Cans must be cleaned with *boiling sal soda* solution and rinsed with clean *boiling* water. Rinsing water from one can must not be used in rinsing another. If means are at hand they had also better be thoroughly steamed for ten minutes. This may be done by putting a quart of clean water in the can and placing on the stove to boil. Do not attempt to wipe out the cans or pails, but let them dry in an inverted position. Wooden stopples should be boiled in sal soda or soap powder solution for fifteen minutes and then rinsed thoroughly.

E. INFECTIOUS DISEASES.

Any disease of an infectious or contagious nature (typhoid fever, scarlet fever, diphtheria, etc.), whether of the person handling the milk or in his family, must be reported to us at once, as several cases have occurred in Somerville, Cambridge, and East Boston, where neglect to do this has resulted disastrously to the dealers.

Keep this for future reference.

APPENDIX III.

The following is a copy of an agreement made between the Medical Milk Commission of Essex County, N. J., and the party supplying milk according to its requirements and receiving its indorsement (names of persons being here omitted):

COPY OF THE AGREEMENT BETWEEN THE MEDICAL MILK COMMISSION OF ESSEX COUNTY, N. J., AND ——— ———, CALDWELL, N. J.

[Dated May 19, 1893.]

The following agreement, made this 19th day of May, 1893, between .... parties of the first part, and ...., New Jersey, party of the second part, witnesseth as follows: That the party of the second part doth hereby bind himself to a fulfillment of the provisions of this contract for and in consideration of the benefits hereinafter named by the parties of the first part.

Furthermore the following-named persons, ..., New Jersey, all acquaintances of the party of the second part, hereby affix their signatures to this agreement, attest to the honor of the party of the second part, and become sureties for the execution of this agreement.

(1) The party of the second part doth hereby agree to conduct such parts of his dairy as may be hereinafter named, collect, and handle its products in conformity with the following code of requirements, for and in consideration of the promised indorsement of the parties of the first part, as hereinafter indicated. The milk thus produced shall be known as certified milk, shall be designed especially for clinical purposes, and when at any time the demand shall be greater than the supply, and

is required by a physician, either for infant feeding or the diet of the sick, it is hereby agreed that such shall be the preferred purchaser.

(2) The party of the second part further agrees to pay for chemical and bacteriological examinations of the aforesaid certified milk at such times as in the judgment of the parties of the first part is desirable.

(3) He also agrees to defray the cost of a bimonthly inspection of his dairy stock or oftener, if necessary, by a competent and approved veterinarian, all of which persons—namely, the chemist, the bacteriologist, the veterinary surgeon—shall be chosen by the parties of the first part, to whom they shall render their reports in writing.

(4) It is expressly understood and agreed that the party of the second part shall not pay more than the sum of $500 in any one year for the services of chemist, bacteriologist, and veterinary surgeon, and the party of the first part shall limit the expense of such service to that amount. It is furthermore agreed that the party of the second part, on receipt of a certified copy of the reports of the experts, shall mail to the persons indicated by the parties of the first part, and not to others, a duplicate printed copy of the foresaid reports, bearing the signatures of the experts and the names of the physicians. The same to be issued at such intervals as in the judgment of the parties of the first part is desirable; also that the necessary expenditures for printing and circulation be met in the same way as herein provided for expert examinations.

LOCATION OF LANDS.

(5) It is hereby understood and agreed that the lands used by the owners, agents, or assigns of the dairy conducted by the party of the second part, and employed for pasturage, or any lands that may hereafter be acquired for such purposes, or such lands as may be used for the cultivation of hay or fodder, shall be subject to the approval of the parties of the first part.

BUILDINGS.

(6) It is also understood and agreed that the buildings, such as stables, creamery, dairy house, and spring house, shall be constructed after the most approved style of architecture, in so far as construction may affect the health of the dairy stock or the character and conditions of the milk.

(7) That the buildings used for the housing of the animals shall be situated on elevated ground and capable of being properly drained.

(8) Said buildings to be sheltered from cold winds, lighted, and ventilated according to approved hygienic methods. The buildings shall be constructed so as to favor the prompt and easy removal of waste products.

(9) The apartments used for the storage of either feed or fodder shall be removed from possible contamination by stable waste or animal odors.

(10) All buildings shall, in addition to healthy location, approved construction, and proper ventilation, be kept free from animal or vegetable matter in a state or process of decomposition or decay, and always free from accumulations of dust or mold.

THE WATER SUPPLY.

(11) The dairy shall be supplied with an abundance of pure water.

(12) No water from shallow wells or springs holding surface drainage shall be used for watering stock, cooling milk, or cleaning vessels.

(13) Nor shall any well or spring be located within 300 feet of the stable.

SURROUNDINGS.

(14) It is further understood and agreed that the immediate surroundings of the buildings shall be kept in a condition of cleanliness and order. There shall not be

allowed to accumulate in the vicinity any loose dirt, rubbish, or decayed vegetable or animal matter or animal waste.

(15) Nor shall there be within 300 yards of any building any constantly wet or marshy ground or stagnant pools of water.

(16) Nor shall there be kept within 300 yards of any building used for dairy purposes any fowl, hogs, horses, or other live stock.

(17) It is hereby understood and agreed that the following unhealthy conditions shall be a sufficient reason to exclude any animal from the herd used for any purpose in the aforesaid dairy: Any animal that is judged by a competent observer to suffer from tuberculosis, even though the disease be localized in a part distant from the vital organs.

(18) Any animal with fever. Any animal suffering from septic absorption or other disease following or associated with parturition.

(19) Any animal suffering either from mammitis or mammary abscess.

(20) Any animal with persistent diarrhea or any other abnormal physical condition which could in any way be detrimental to the character of the milk.

(21) It is furthermore agreed that when an animal shall be found by a competent observer to be in a state of ill health, prejudicial either to the other animals in the herd or to human health, the same shall be removed immediately, and if necessary shall be killed.

(22) It is also understood and agreed that the party of the second part shall exclude from the herd used for producing certified milk, immediately after discovery, any animal subject to the following conditions: Any animal that was bred through consanguinity within a period of three generations.

(23) And from this time forth any animal of those bred by the party of the second part, used for producing certified milk, that was not, as a heifer, kept sterile during its first twenty-seven months.

(24) Any phenomenal milker, except that glandular disease or tuberculosis has first been excluded by a competent observer.

(25) It is furthermore agreed that if at any time it is desired by the parties of the first part that a different breed of milch cows should be substituted for the one in use, in order that the standards of quality in the milk may be raised, the party of the second part will endeavor to carry the same into effect.

HOUSING AND CARE.

(26) It is furthermore agreed that the dairy stock employed in the production of certified milk shall be properly sheltered from the influence of weather and climate prejudicial to their health; also that the animals shall be kept clean, groomed every day, and treated kindly at all times.

(27) The waste products of the stable shall be removed so frequently, and the stable floor so thoroughly cleaned, that the same shall be as free as possible from animal odors.

(28) It is also agreed that no milch cow shall be used for dairy purposes while in a state of excitement, either as a result, or during the period of, estrux, or which has been made nervous either by beating, whipping, kicking, prodding, or running.

FEEDING.

(29) It is hereby understood and agreed that the methods of feeding the cows furnishing the certified milk shall be subject to the approval of the parties of the first part. The feed and fodder shall consist only of nutritious and wholesome materials, such as grass, clover and timothy hay, whole grain, or the entire result of the grist. No materials shall be employed which are or may become injurious to the health of the animals. There shall not be fed at any time or in any quantity, either alone or mixed with other feed or fodder, hulls, screenings, wet or dry brewers' grains, oil

cake, sour ensilage, the refuse from distilleries, glucose of starch factories, any waste by-product in the treatment of grain, low marsh grass, or any of the questionable or exhausted feeds or fodders employed either to increase the milking capacity of the animal, or that will produce an impoverished milk, or that will impart to it unnatural odors or flavors. Nor shall the cows be allowed to eat green or worm-eaten fruit, poisonous weeds, or to drink poisonous or stagnant water.

COLLECTING AND HANDLING.

(30) It is furthermore understood and agreed that the cows from which is obtained certified milk shall be milked only in a clean building, and not in an illy ventilated stable containing foul odors and bad air.

(31) No animal furnishing certified milk shall be milked until the udder shall first have been cleaned in a manner approved by the parties of the first part.

(32) No person shall be allowed to draw the milk that has not, within fifteen minutes of the milking, first washed his or her hands, using soap and nail brush, and afterwards thoroughly rinsing the hands in clean water.

(33) The person or persons engaged in milking shall also be dressed in clean overclothes.

(34) No person shall be allowed to draw the milk who has been engaged with the care of horses in the same clothing or without first washing his hands.

(35) No milk shall be represented as certified milk that is not received from the udder into vessels, and from these into cooling cans, both of which are perfectly clean and dry, having been cleansed and heated at a temperature adequate to effect complete sterilization since the last milking and have been kept inverted in a clean, dry, and odorless atmosphere.

(36) No milk shall be represented as certified milk that has not been passed through a sieve of wire or other cloth, either while milking or immediately thereafter, having not less than 100 meshes to the linear inch.

(37) No milk shall be represented as certified milk that does not consist of the entire contents of the udder at each milking, including the foremilk, middlings, and strippings.

(38) No milk shall be represented as certified milk that has been drawn from the animal at abnormal hours, such as midnight or noon, nor from any animal for a period of nine weeks before calving, or that has not been separated for nine days after parturition.

(39) No milk shall be represented as certified milk which has been exposed to the emanation or infection of any form of communicable disease, either in the person or persons handling the milk or by accidental contamination in cleaning milk containers, or by the association of any person engaged in handling the milk, with person or persons sick of contagious disease.

PREPARATION FOR SHIPMENT.

(40) It is hereby understood and agreed that all milk represented as certified milk shall receive every known detail of care that will promote its keeping qualities and favor its safe transportation.

(41) That the milk on being drawn from the cow shall be treated by ice or clean, cold water in motion, and proper aeration, in order, first, to remove its animal heat, and, second, to reduce its temperature to a point not above 50° nor below 40° F.; said temperature to be acquired within forty-five minutes after milking and maintained within the above limits while held for shipment, during its transportation, and until it is delivered to the purchaser.

(42) That the cooling of the milk shall not be conducted in the same building in which it is drawn, nor in an atmosphere containing dust or tainted with animal odo

(43) That all the foregoing provisions concerning the cleansing and condition of vessels or utensils shall be complied with in the said cooling process.

(44) It is furthermore agreed that no milk shall be represented as certified milk that has been changed or reduced in any way by the addition of water or any solid or liquid substance in or out of solution, or the subtraction or removal, in any manner, of any part thereof.

(45) It is hereby understood and agreed that all milk to be represented as certified milk shall be packed in flint glass quart jars immediately after it is cooled.

(46) Said jars to be of a pattern approved by the parties of the first part.

(47) It is furthermore agreed that the bottles or jars, before being used, shall be cleaned by hand, separately, with the aid of hot water, alkaline soaps, rotating brush and steam, and that they shall be rinsed in two separate baths of clean, hot water and then thoroughly dried and kept inverted until used, without covers, in a clean dry atmosphere free from odors.

(48) It is agreed that the jars shall be filled by a method approved by the parties of the first part.

(49) That they shall be sealed, after all air has been excluded, by the most approved device for closing them.

(50) The bottles after being filled shall be labeled across the cap, bearing the words "Certified milk," with the name of the dairyman, together with the date of milking.

(51) It is furthermore agreed that no milk shall be sold as certified milk that is more than three hours old when bottled nor more than twenty-four hours old when delivered.

TRANSPORTATION AND DELIVERY.

(52) It is hereby understood and agreed that the transportation and distribution of all milk represented as certified milk shall be conducted by the party of the second part, either in person or by persons employed by him.

(53) That in transit the milk shall not be exposed to any of the foregoing prohibitory conditions.

(54) That it shall not be subjected to agitation.

(55) That it shall not be exposed to the heat of the sun.

(56) That the delivery wagons shall be so constructed that the required temperature of the milk may be maintained during transit.

(57) That before the wagons are filled for shipment the body, the trays, and compartments shall be flushed with boiling water.

(58) It is furthermore agreed that the distributing agents shall, during the transfer of the milk from the dairy to the purchaser, be subject to the following restrictions, namely, that they shall use no tobacco.

(59) That they shall take no intoxicating drinks.

(60) That they shall not collect the empty containers, nor receive money or milk checks from houses in which an infectious or contagious disease is known to exist.

(61) It is also hereby agreed that the collection of empty bottles from places where infectious or contagious disease is known to exist shall be made by other persons than those employed to deliver the milk.

(62) That these collections be made with wagons not employed in the distribution of the milk.

(63) That before these empty bottles shall be returned to the dairy they shall be carried to a separate building and first be subjected to the process of cleaning bottles indicated in a former clause of this contract.

(64) It is hereby understood and agreed that if any further precautions or changes in method calculated to improve the quality of milk or guard the same from impurities or dangers is desired, that the party of the second part will cheerfully be gov-

erned by such additional rules and regulations as may be laid down by the parties of the first part.

(65) It is understood and agreed by the party of the second part, the same binding the owners, agents, or assigns of the aforesaid dairy, that the product known as certified milk shall be under the following restrictions in its sale, namely: That until the amount required within the boundaries of Essex County shall first be supplied, it shall not be sold beyond these limits, except that the parties of the first part shall give their consent.

(66) It is furthermore agreed by the party of the second part, the same binding the owners, agents, or assigns of the aforesaid dairy, that in the event of a failure to comply with any or all of the requirements of the foregoing contract, the party of the first part shall reserve the right to withdraw from the contract and publish the fact in such manner as they deem best.

(67) Finally, it is understood and agreed that nothing in this contract shall prevent the abrogation of any of the provisions of the same by the parties of the first part, provided that it shall be done for the purpose of substituting other provisions designed to promote the objects of their organization.

(68) It is further understood and agreed by and between the parties hereto that the party of the second part shall be at liberty to cancel this agreement by giving two months' notice in writing of his desire to do so, in case of inability for any reason to comply with the terms of the same.

In witness whereof, the said parties have hereunto set their hands the day and year first above written.

—— ——,
—— ——,
—— ——,
—— ——,
—— ——,
—— ——,
Parties of First Part.

—— ——,
Party of Second Part.

—— ——,
—— ——,
—— ——,
Sureties.

At frequent intervals reports upon the conditions of the dairy and quality of the milk are rendered to the commission by experts appointed for this purpose.

APPENDIX IV.

Following are copies of blank forms used in the supervision of market milk. For brief discussion of them see page 22. A suitable space for the answer to each question is always provided, but in the longer forms the spaces are here shortened.

Form for application for milk license, Cambridge, Mass.

CITY OF CAMBRIDGE. OFFICE OF INSPECTOR OF MILK, CITY HALL.

APPLICATION FOR MILK LICENSE.

Date of application, ... Present license No. ....

Name (if a firm, give firm name and also individual members' names in full):

....

Address:

....

No. of teams:	Driver.	Residence.
1.	....	....
2.	....	....
3.	....	....
4.	....	....
5.	....	....

No. of cans of milk sold per day in Cambridge { Wholesale, ...
Retail, ...

Cream, quarts, ... Skimmed milk, cans, ...

Source of milk (if from a contractor, give name of contractor; if from farms, give the town or towns where they are located; if from your own farm, give location of dairy and number of cows kept.)

....

Signature of applicant: ....

Form for application for milk license, Chicago, Ill.

DEPARTMENT OF HEALTH, CITY OF CHICAGO. DIVISION OF MILK INSPECTION.

APPLICATION FOR MILK LICENSE.

STORE LICENSE.

......, 189..

Name, ... Location of business place or places, ... Number of wagons, ... Number of cows, ... Description of wagon or wagons (number, inscription, and color), ...

Your attention is called to the section of the milk ordinance relating to applications for milk licenses:

"SEC. 17. (License, issue of, application for.) Licenses shall be issued in the names of the applicants therefor. Before the issuance of the license every vendor of milk or cream shall make written application therefor on a printed form provided for that purpose, on which shall be stated:

"First. The name, residence, and location of the business place or places of the applicant.

"Second. The number of cows, if any, owned or controlled by the applicant.

"Third. The number and description of each and every wagon, carriage, or other vehicle used in the milk or cream business.

"Fourth. If, after the issuance and delivery of the license, any change be made in the location of the place of business of such licensee, notice thereof must forthwith be given to the chief of milk inspection."

Signed: ....

TO THE CITY COLLECTOR:

The above application is approved and issue of license is hereby recommended.

......, *Commissioner of Health.*

License No. ......

NOTE.—The form used in applying for wagon license is the same in all respects, except it is a different color.

Form for application for milk license, Erie, Pa.

APPLICATION FOR MILK LICENSE.

BOARD OF HEALTH,
Erie, Pa., ..., ...

I hereby make application for permission to sell milk in the city of Erie, from a ......, subject to your rules and regulations.

The dairies from which I obtain milk are located in ...... township, and are owned by .... There are no injured or diseased cattle in the herd or herds from which said milk is obtained; and there are no cases of typhoid fever, consumption, diphtheria, scarlatina, or other contagious or infectious diseases in my house, family, or among my employees or in the house, family, or among the employees of the owner of said dairy or dairies. In case of the appearance of any of the above-mentioned diseases I will immediately make report thereof to the board of health.

Name: ....
Residence: ....

Sworn and subscribed before me this ...... day of ......, ...

......, *Secretary Board of Health.*

Form for application for inspection, Meadville, Pa.

APPLICATION FOR INSPECTION.

To ......,
Inspector of Food and Milk for the City of Meadville, Pa.:

Desiring to sell milk to the citizens of Meadville, Pa., I make application to you to inspect my cattle and appointments for the supply of milk, under the rules and regulations of the board of health of said city, and I hereby agree to observe strictly the following regulations regarding the milk which I supply to all my customers:

No milk shall be delivered—

(1) From cows that are unhealthy; from cows receiving any kind of medicine; from cows with inflamed udder or with udder or any part thereof in an abnormal condition from any cause; from cows while in heat, unless such cows are kept from the rest of the herd during that time; from cows within 60 days before or six days after calving.

(2) From cows that are fed partially or wholly on turnips, cabbage, ensilage, brewery, or distillery malt, rancid foods, or any other kind of food that would deteriorate or taint the quality of the milk; from cows supplied with bad or impure drinking water.

(3) Nor shall any milk be delivered which has been drawn from the cow more than fifteen hours, nor from which any part of the cream has been removed, or from which strippings have been kept back; nor will I sell during the summer any milk which was milked prior to 5 o'clock in the afternoon, nor milk which differs in any way from fresh, sound, pure, unadulterated cow's milk.

(4) I also agree that I will not furnish milk from any cows unless they have been inspected by milk inspector for Meadville board of health, and that my cows are to be milked in the cleanest possible manner, without moistening the teats; that milkers' hands shall be kept clean, and udders wiped with a clean damp cloth just before milking. I also agree that all my milkers shall wear a clean outer garment, to be used for no other purpose than for milking, and to be worn at each milking.

I agree to remove each cow's milk immediately after milking from the stable and to strain, cool, and aerate all of my milk until the temperature is reduced to 58° F. in less than 45 minutes by placing the cans in a tub or vat, said tub or vat to hold three times as much water as the quantity of milk to be cooled, water in said tub or vat to be renewed daily.

I agree that special care shall be taken to remove daily all manure from the stables and anything of a foul or unclean nature, and to keep my stables clean, and whitewash the same each fall and spring every year.

I agree to keep my cow yards reasonably free from mud or manure, and that I will not stack manure against my cow stables at any time.

I agree should any member of my family or employee become sick with any contagious disease that I will immediately notify the health officer and milk inspector of the Meadville board of health.

I agree to notify the milk inspector of any dwelling placarded for contagious disease, if said building is occupied by persons to whom I sell milk.

I also agree that the Meadville board of health, or any member thereof, or any person in the employ of said board, shall have the right to visit at any time my premises for the purpose of inspecting the cows, stables, milk house, food and water supply, and take samples of milk at any time from my dairy or on my route, in order to see that the foregoing rules are observed.

Having read the above, I hereby agree to all the provisions contained therein and hereby agree that the Meadville board of health may revoke my permit for noncompliance of said provisions at any time.

Signed: ....,
...... 19...

Form for application for milk license, Iowa.

CITY MILK DEALER'S REPORT FOR YEAR ENDING JULY 4, 1901.

The law requires that the permit be taken out before selling milk or cream. Any one selling milk without having the permit is subject to the penalties named in the law. See below. This department will not hold itself under obligations to send further notice, and action will begun at the discretion of the dairy commissioner after the 4th day of July, 1901, without further notice.

READ THE LAW.

SEC. 2525. *Permits.*—Any person or corporation who shall sell milk or cream from a wagon, depot, or store, or sell or deliver milk or cream to a hotel or restaurant or boarding house, or any public place in any such city, shall be considered a city milk dealer. No such city milk dealer shall sell milk or cream from a wagon, depot, or store in any such city without a written permit from the commissioner for each wagon, depot, or store operated by him, for which he shall pay annually one dollar. All permits shall expire on the fourth day of July of each year, and no permits shall be issued for less than one dollar.

SEC. 2527. *Penalties.*—Whoever shall violate any provisions of this chapter shall be punished by a fine not exceeding five hundred dollars, or by imprisonment in the county jail not exceeding six months, or by both such fine and imprisonment, at the discretion of the court.

Name of dealer, firm, or company. (Please write all names and addresses plainly.) ......

City, ... Street and number or P. O. box, ...

Do you sell whole milk? ...... Cream? ...... Skimmed milk? ......

How many months in the year do you conduct your business? ......

How many families, hotels, etc., do you supply? Private families, ... Hotels, ... Restaurants and lunch counters, ... Boarding houses, ... Ice-cream parlors and soda fountains, ...

State average number of gallons milk sold per month. ...... gallons.

State average number of gallons cream sold per month. ...... gallons.

State average number of gallons skimmed milk sold per month. ...... gallons.

Is the milk and cream which you sell delivered to you? ...... If so, give name of person from whom you receive the same. ...... Is he a retailer of milk? ......

If you produce your own milk, state average number of cows in your herd. ......

State number of Jerseys. ...... Grade Jerseys. ......

Number of Holsteins. ...... Grade Holsteins. ......

Number of Shorthorns. ...... Grade Shorthorns. ......

Number of Red Polled. ...... Grade Red Polled. ......

Number of cows of other breeds or common stock. ......

What is the number of persons employed in your dairy business? ......

Do you wholesale milk to others? ...... If so, give the names of all to whom you sell milk or cream. ......

Name, ... Street or P. O. address, ...
Name, ... Street or P. O. address, ...
Name, ... Street or P. O. address, ...
Name, ... Street or P. O. address, ...

APPLICATION FOR PERMIT.

NOTE.—When more than one wagon, depot, or store is operated, each should be numbered from one up to the number used.

.... 1901.

......, *State Dairy Commissioner, Des Moines, Iowa:*

...... hereby make application for ...... permit.. to sell milk in the city of ......, Iowa, for the year ending July 4, 1902. The following is a memoranda of each depot, store, or wagon under the management of the undersigned:

...... street.
Store or shop located at No ...... street.
Wagon No. 1 starts from No ...... street.
Wagon No. 2 starts from No ...... street.
Wagon No. 3 starts from No ...... street.
Wagon No. 4 starts from No ...... street.

Herewith find inclosed a draft, postal money order, or express money order to the amount of ...... dollars, for which please forward the number of permits enumerated above.

Signature: ....

NOTE.—In all cases $1 must accompany the application. This department will not assume or recognize any loss arising from remittances by cash or postage stamps.

All permits expire July 4 of each year.

Form to accompany application for milk license, Haverhill, Mass.

CITY OF HAVERHILL, OFFICE OF INSPECTOR OF MILK.

TO THE MILK DEALERS OF HAVERHILL:

Owing to the insanitary manner in which a great number of milk cows are kept and cared for, and the unwholesome and careless methods of some producers in obtaining and caring for milk at the time of milking and immediately thereafter, it becomes the duty of the inspector of milk to hereby notify you that all applicants for milk licenses to sell milk within the limits of the city of Haverhill for the year beginning May 1, 1900, are requested to have the producer from whom such milk is obtained fill out the following form:

Producer's name.... . To what dealer do you sell your milk?...... How many cows in your possession?...... Have they been inspected within the last six months?

...... By whom?...... Give length of stable...... Give width of stable...... Give width from manger or "tie ups" to wall behind animals...... Give average height from floor to ceiling...... Number of windows facing north not obstructed ...... Size...... Number of windows facing south not obstructed...... Size ...... Number of windows facing east not obstructed...... Size...... Number of windows facing west not obstructed...... Size...... Is the stable open or closed in front of animals?...... Is the stable well lighted?...... Is the stable in basement or cellar?...... When is the stable cleaned?...... What is done with the manure?...... Is there a cellar under barn?...... Is the cellar open or closed? ...... Does the air in the stable seem good? or is it heavy or bad smelling?...... How is the stock watered?...... If from well, give its location in regard to barn cellar, manure yard, sink drain, privy vault, cesspool, or other source of possible contamination...... When is stock cleaned?...... What do you bed your milk cows on?...... Are they milked by clean and healthy attendants?...... Do you mix the milk from all your cows?...... How and where do you mix your milk?...... Are any of your cows sick or diseased at the present time?......

Form for application to sell milk, New York City, N. Y.

38 G, 1899.

No......

BOROUGH OF MANHATTAN.

APPLICATION (STORE) No. 1.

TO THE BOARD OF HEALTH OF THE DEPARTMENT OF HEALTH OF THE CITY OF NEW YORK:

The undersigned hereby applies for a permit to sell fresh and condensed milk in the city of New York, and makes the following statement in accordance with the laws, rules, and regulations of the board of health of the department of health of the city of New York:

FRESH MILK.

Name, ... Business, ... Location, ... Quarts sold per day...... From whom purchased[a] ...... Location, ... Time of delivery, ... Marks on can, ...

CONDENSED MILK.

From whom purchased,[a] ...... Location, ... Quarts sold per day, ... Time of delivery, ... Where is fresh or condensed milk kept during sale?...... How is ice box connected with sewer?...... Where located, ...

Signed, ...
Address, ...

Dated New York ......, 189..

This form to accompany preceding blank when applicable, New York City, N. Y.

FORM 123 C—1896.

No......

SPECIAL INFORMATION BLANK No. 3.

Milk purchased or obtained from farmer, milk agent, creamery, condensary, or from farm belonging to applicant.

Name of milk agent, ... Residence, ... Name of farmer, owner of creamery or condensary, ... Town, ... County, ... State, ... Shipping station, ... Railroad, ... County, ... State, ... No. of cans per day, ... Marks on cans, ... Time shipped, ... What milking shipped, ... Time in transit, ... No. of cows, ... Breed, ... Condition, ... Food, ... Housing, ... If in the city, ... Permit No...... Water supply for cows and where obtained, ...

---

[a] If purchased or obtained from farmer, milk agent, creamery, condensary, or from farm belonging to applicant, fill in special information blank No. 3.

Signed, ...
Address, ...

Dated New York, ..., 189..

Form for application to bring milk into the District of Columbia.

HEALTH DEPARTMENT, DISTRICT OF COLUMBIA,
Washington, ..., ...

SIR: The act to regulate the sale of milk in the District of Columbia provides that "no person shall bring or send into the District of Columbia for sale any milk without a permit so to do from the health officer of said District, and that such permits shall be issued subject to the following conditions:

That none but pure and unadulterated milk shall be, with knowledge of its impurity, brought into said District.

That in the management of the dairy farm upon which the milk is produced, or of the dairy at which the milk is collected and stored prior to shipment, the applicant shall be governed by the regulations of the health office of the District of Columbia, approved by the Commissioners of said District, issued for dairies and dairy farms in said District, when said regulations do not conflict with the law of the State in which said dairy or dairy farm is located.

The said dairy or dairy farm may be inspected at any time without notice by the health officer of the District of Columbia or his duly appointed representatives.

The veterinarian's certificate must be from one who has regularly graduated from a veterinary medical college, or who practices under a license from a State examining board. If unable to secure the services of such, so state on your application blank, and all other conditions being satisfactory, action will be suspended until this requirement is met, thus enabling you to send or bring milk into the District without violation of existing law.

If you desire to bring or send milk into the District of Columbia for sale, please fill out and sign the application below and forward it to the health officer without delay. Permits will be issued, without cost, as soon as possible after the receipt of the application.

The application for and acceptance of a permit necessarily carries with it the acceptance of the conditions specified above. A copy of the regulations referred to is inclosed herewith.

Respectfully,

WM. C. WOODWARD, M. D.,
Health Officer.

To ......
......

APPLICATION FOR PERMIT TO SEND OR BRING MILK INTO THE DISTRICT OF COLUMBIA.

TO THE HEALTH OFFICER, D. C.

SIR: In compliance with "An act to regulate the sale of milk in the District of Columbia, and for other purposes," I hereby make application for a permit to send or bring milk into said District, from the premises described below, located ...... Number of shipments per day, ... Total number of gallons, ... whole milk, skimmed milk, cream. Shipped in wagon, ...; boat, ...; B. and O. R. R., ...; B. and P. R. R., ... Time of delivery, ... Place of delivery, ... Consigned to ......

DESCRIPTION OF PREMISES.

BUILDING.

Brick, ... Frame, ... stories high. Condition, ... Is any part of it used for any other than dairy purposes? ...... If so, specify, in the space for remarks, what parts of it are so used, and the purposes for which used.

Room for cattle.—Size, ... long, ... wide, ... high. Floor, kind, ...; condition, ... Is it properly sloped and guttered? ...... What disposition is made of the drainage? ...... Ventilation and lighting. How accomplished? ...... Windows. How many? ...... Location, ... Size, ... Are windows glazed? ...... Ventilators. How many? ...... Kind, ... Location, ... Size, ... Doors. How many? ...... Location, ... Stalls. Where located? ...... How many? ...... Size of each? ...... wide, ... long, ... wide, ... long. Are animals of any kind other than cattle kept in this room? ...... If so, specify how many and what kind. ......

Feeding troughs or boxes.—How many? ...... Kind, ... Location, ... Condition, ...

Water troughs.—How many? ...... Kind, ... Location, ... Condition, ... If water troughs are not used, how are cattle watered? ......

Source of water supply.—If from well, state location ...... Approximate depth ...... feet, and construction ...... Location of well with reference to nearest privy. State distance and slope of ground ...... Location of well with reference to place where dung is deposited. State distance and slope of ground ...... Has water any perceptible odor, color, or taste? ...... If so, describe ......

Receptacles for dung and other refuse.—How many? ...... Kind ...... Location ...... Condition ......

Receptacles for milk.—How many? ...... Kind ...... Condition ...... What provision is made for cleaning? ...... Is milk cooled immediately after milking? ...... If so, how? ......

BARNYARD.

Size ...... long ...... wide ...... Is it properly graded? ...... and drained? ...... Is it paved? ...... What disposition is made of the drainage? ...... What is its condition as to cleanliness, at time of inspection? ......

PASTURE.

Size of ...... Condition of ...... Is it supplied with drinking water for the cattle? ...... If so, from what source? ......

CATTLE.

How many milch cows are usually kept? ...... How many other cattle, if any, are kept in the same stable? ...... Kind of milch cows used ...... Condition of cows at time of inspection. General condition ...... Cleanliness, etc ...... Character of feed ......

PRIVY ACCOMMODATIONS.

How is human excreta from the premises disposed of? ...... Location of privy, if any? ...... Construction of privy ......

Signature of applicant: ....
Post-office address: ....

The above covers three pages of a four-page circular. On the last page provision is made for the certificate of the veterinarian who has examined the herd and premises described; also memoranda to appear on the outside fold when ready for filing. It is as follows:

.... 189

TO THE HEALTH OFFICER, D. C.

SIR: I have carefully examined the cattle upon the premises above referred to, and their condition is as follows: ......

Signature: ....
Address: ....

Personally appeared before me this ...... day of ...... 189., the subscriber, who, being duly sworn, deposes and says that he is a veterinary surgeon, practicing in accordance with the laws of the State in which he resides, and that he has personally examined the cattle referred to in the above statement and knows them to be the same as are referred to in the application to which the certificate is appended, and that their condition is correctly described without evasion or concealment.

Signature: ....
Address: ....

Forms containing all the above questions under "Description of premises" are used by inspectors for reporting conditions found on their visits.

Form for application to sell milk, Boston, Mass.

APPLICATION FOR LICENSE TO SELL MILK IN THE CITY OF BOSTON DURING THE YEAR ENDING MAY 31, 1900.

Name of applicant, ... Residence (street and number, town), ... Place of business, ... Number of wagons used in delivery of milk, ... Number of drivers employed, ...

Names of drivers.	Residences.
....	....
....	....
....	....
....	....
....	....

Section supplied, ... Amount of milk raised (quarts), ... Number of cows kept, ... (If any, fill out Form 3.) Amount of milk bought (quarts), ... Of whom bought, ... Where delivered by him, ... Hour delivered, ... a. m.; ...... p. m. Where stored and handled after delivery, ... Whether mixed, handled, or stored where cows, horses, or other animals are kept, or where manure is stored, ... Whether mixed, handled, or stored in rooms used for domestic purposes or sleeping rooms, ... Location of milk room, ... How drained, ... Whether walls are tight and easily cleaned, ... Whether floor is tight and easily cleaned, ... Whether appliances are at hand for washing or sterilizing all utensils, ... Whether any water-closet, urinal, or privy is located in the room, ... Whether ice-box or refrigerator drained, and how, ...

The above is a correct statement.

Signature ....

Witness ......
Boston ......
License issued ......
Number of license ......

Form for report upon dairy and herd inspection in North Dakota.

STATE OF NORTH DAKOTA,
OFFICE OF ASSISTANT DAIRY COMMISSIONER,
OFFICIAL DAIRY AND HERD INSPECTION,
Date, ...

City, ... County, ... Location, ... Dairyman's name, ... P. O. address, ... No cows, ... No. license, ... Condition of cows (flesh), ... Condition of cows, sanitary, ... Condition of cows, apparent health, ... Condition of barn, ... Ventilation of barn, ... Condition of utensils, ... Kind of feed, ... Water, ... Where milk is kept, ... Method of delivery, ... Breed of cows, ... Tuberculin test, ... Remarks, ...

...., *Inspector.*

Form for report upon inspection of dairies, Erie, Pa.

INSPECTION OF DAIRY.

Date, ... Owner, ... Residence, ... Name of tenant, ... Location of dairy, ... No. of wagons, ... Section of city supplied, ... Examination of cows: No. clean, ... No. unclean, ... No. healthy, ... No. unhealthy, ... No. suspected, ... How fed in summer, ... How fed in winter, ... How watered, ... Disposition of at night, ... Stable: Material, ... size, ... how ventilated, ... drainage, ... No. of stalls, ... Disposition of manure: Temporary, ... permanent, ... Water supply: Source, ... distance from house, ... from stable, ... from privy, ...from manure pile, ... Milkers: No. male, ... No. female, ... No. healthy, ... No. unhealthy, ... Sickness in family, ... in neighborhood ...... Milk: Where stored, ... how long, ... in what, ... how cooled, ... Remarks: ......

....,
Inspector.

Form for report upon inspection for dairies, Salt Lake City, Utah.

DAIRY AND MILK REPORT.

......., 189.. 1. Name of dairy, ... 2. Permit No...... 3. Location, ... 4. Name of proprietor, ... 5. Post-office address, ... 6. Date of inspection, ... 7. Average quantity of milk sold per day, ... 8. No. wagons, ... 9. No. cows, ... 10. Grade of cows, ... 11. No. acres of pasturage, ... 12. Condition of cows, ... 13. Condition of milking utensils and how cleaned, ... 14. General appearance of milkers and other employes, ... 15. Water supply, ... 16. General sanitary condition, ... 17. Quantity and kinds of food: Hay—alfalfa, ... pounds per day; mixed, ... pounds per day. Bran, ... pounds per day. Shorts, ... pounds per day. Malts, ... pounds per day. Grains, ... pounds per day. Beet pulp, ... pounds per day. 18. Quality of milk, ... 19. Remarks......

......, *Meat and Milk Inspector.*

Form for reporting conditions of dairies, Boston, Mass.

Statement of conditions under which cows are kept, and milk therefrom stored, on the premises of ......, at (town) ......, (State) ......, said milk being supplied by ...... to ......, for sale in the city of Boston, Mass.

STABLE.

Number of cows kept, ...; approximate air space per cow, ... Whether cow stable is well lighted, ... Whether cow stable is well ventilated, ... How drained, ... Condition of floor, ... Whether manure is stored in cellar, ... If not in cellar, where stored? ......

MILK ROOM.

Whether milk is cooled, mixed, or stored where cows or other animals are kept, or where manure is stored, ... Whether cooled, mixed, or stored in rooms used for domestic purposes or sleeping rooms, ... Location of milk room, ... Whether walls are tight and easily cleaned, ... Whether floor is tight and easily cleaned, ... Whether appliances are at hand for washing or sterilizing all utensils, ... Whether any water-closet, urinal, or privy is located in the room, ...

CONDITION OF COWS.

Date of last examination of cows, ... By whom examined, ... Number examined, ... Whether any cows were found to be diseased, ... Whether any cows have been added since; and if so, how many? ...... Whether added cows were examined; and if so, when and by whom? ......

SHIPMENT OF MILK.

Amount of milk shipped, ... To whom shipped, ... How shipped, ... Marks on cans, ...

The above is a correct statement.

Signature, ...
Address, ...

Witness, ...
Date, ...

Form for reporting conditions at dairies and methods of handling milk in New Jersey.

RECORD OF DAIRY INSPECTION.

BOARD OF HEALTH OF THE STATE OF NEW JERSEY,

....

1. Name of dairyman, ... (tenant—owner).
2. Post-office, township, county, ...
3. Location of dairy, ...

STABLE.

4. Size of stable, ...
5. Cubic feet per cow, ...
6. Stable well lighted? ......
7. Material, construction, and drainage of floor, ...
8. Method and frequency of cleaning, ...
9. Was stable clean at time of inspection? ......
10. Are side walls, ceilings, and ledges kept free from cobwebs and dust? ......
11. Ever lime washed? ......

WATER SUPPLY.

12. Sources of water supply for watering stock, ...
13. Sources of water supply for washing cans, bottles, and utensils, ...
14. Distance of well or spring from stable, ...

15. Distance from manure pile, ...
16. Distance from privy vault, ...
17. Distance from other sources of contamination, ...
18. Is well apparently liable to contamination? ......
19. Was sample of water taken for analysis? ...... 20. Marks, ...

CATTLE.

21. Number of cows, ... 22. Breed, ...
23. State of health, ...
24. Ever examined? ...... 25. By whom? ......
26. Date of last examination, ...
27. Were cows in a cleanly condition at time of inspection? ......
28. Amount, kind, and quality of feed used, ...
29. Cows pastured? ......

MANURE.

30. How and where stored? ......
31. How frequently removed? ......
32. Quantity of manure at time of this inspection, ...

UTENSILS.

33. How washed and dried? ......
34. Where are the utensils washed? ......
35. Any appliance for sterilizing cans, pails, and dippers? ......
36. Bottles—how washed and dried? ......

COLLECTION OF MILK.

37. Quantity of milk produced daily, ...
38. Are milkers' hands washed before milking? ......
39. Are clean garments put on? ......
40. Udders of cows cleaned? ...... 41. How? ......
42. When pail is full of milk what is done with it? ......
43. Where does the can stand? ......
44. Is can kept covered? ......
45. Is milk cooled? ...... 46. How? ......
47. How long after milking? ......
48. To what temperature? ......
49. Is milk bottled? ......
50. How long after cooling? ......
51. Where is milk bottled? ......
52. Where is milk stored? ......
53. How long is milk stored before being shipped? ......
54. Source of ice supply, ...
55. If shipped, to whom, and where? ......

DISTRIBUTION.

56. Temperature of milk when delivered to customers, ...
57. Quarts sold from cans, ...
58. Quarts sold in bottles, ...
59. Ever run short? ......
60. If so, where is supply obtained? ......
61. How many persons handle the milk? ......
62. All in good health? ......
63. Date of last sickness among persons on dairy premises, ...
64. Diseases, ...
65. Remarks, ...

......, *Inspector.*

Form for notice which must be sent to the inspector when cows are added to a dairy herd, Kansas City, Kans.

To MILK PRODUCERS:

Under the milk inspection ordinance it is made unlawful for anyone, after his dairy is inspected, to add any cows to his dairy, unless, within twenty-fours hours, he shall notify the inspector of such addition. In case you shall add any cows to your inspected dairy, please fill out the following statement and promptly send it to the inspector of licenses, weights, and measures, City Hall, Kansas City, Kans.:

To THE INSPECTOR OF LICENSES, WEIGHTS, AND MEASURES:

I have this day added ...... cows to my dairy kept at ......, and I hereby declare the cows so added to said dairy are each and all in a healthy condition.

Sign here ......

Dairy Inspection No.......

Form for placing in quarantine cows suspected of having tuberculosis, North Attleboro, Mass.

Form No. 3*a*.—'95.

ORDER OF QUARANTINE.

[Section 7, Chapter 491, Acts of 1894.]

ORIGINAL.

[To be delivered to owner or person in charge.]

☞ *To be used only for cows in milk suspected of being tuberculous.*

Town or city of ......, ..., 189..

To ......, owner (or person in charge):

You are hereby notified that, by virtue of the powers and authority in me vested by law, I have caused to be isolated and placed in quarantine in ...... upon your premises, to wit, ... the milch cow described as follows: ...... under suspicion of having the disease known as tuberculosis, a contagious disease under the law.

You and all other persons whom it may concern are hereby forbidden to remove the same from said place of quarantine for the purpose of slaughter or for any other purpose whatsoever, or otherwise to break said quarantine, until the further order of the local board of health, the cattle commission, or some one of its members.

You are notified that until this quarantine is removed said cow is deemed to be diseased. You are warned of the danger of using the milk therefrom, and are forbidden to sell or otherwise dispose of it in any market.

The Commonwealth will pay the actual expense of this quarantine which may be incurred after the tenth day, upon your returning to the board of cattle commissioners a satisfactory certificate of such expense.

[*Use a separate order for each animal.*]

......, *Inspector.*

READ THE OTHER SIDE.

(NOTE.—Upon the back of the form is printed in full the section of the law referred to above, relating to cattle quarantine.)

Form for milk-store permit, New York City, N. Y.

DEPARTMENT OF HEALTH, CITY OF NEW YORK,
New York, ..., *189..*

Permit No. ......

...... is hereby authorized to sell milk, fresh and condensed, at No. ......, borough of Manhattan, under the laws, rules, and regulations of the board of health of the department of health of the city of New York.

This permit is not transferable to any person or location other than above, and must be kept posted at all times in a conspicuous place in this store, and is revocable at the pleasure of the board.

By order of the board of health.

[Signed by the president and secretary.]

Form for milk-wagon permit, New York City, N. Y.

39 G—1899.

DEPARTMENT OF HEALTH OF THE CITY OF NEW YORK,
BOROUGH OF MANHATTAN,

Permit No. ...... *New York*, ..., *189..*

...... residing at ......, borough of ......, is hereby authorized to sell fresh and condensed milk from wagon No. ...... in the city of New York, under the laws, rules, and regulations of the board of health of the department of health of said city. This permit is revocable at the pleasure of the board.

By order of the board of health.

......, *President*.

......, *Secretary*.
Countersigned: ......

[Reverse side.]

This permit is void if used for any wagon except the one designated on the face.

Driver's name ......
Residence .....
Borough of ......

NOT TRANSFERABLE.

Form for notification that license to sell milk must be secured.—Newton, Mass.

CITY OF NEWTON, DEPARTMENT OF MILK INSPECTION.

The public statutes provide (chapter 57, section 4), that all persons before selling or offering for sale milk in any store, booth, stand, or market place in any city must be registered in the books of the milk inspector, and a license fee of fifty cents is required.

As you are reported as engaged in the sale of milk, and not registered, you are hereby notified that unless the provisions of the statute are complied with forthwith you will be complained of and liable to a fine not exceeding twenty dollars.

Please bring this notice with you.

Respectfully, ..., *Inspector of Milk.*

Form for dairymen's permit to sell milk, and stub for same, Los Angeles, Cal.

No. ...... Application No. ......

Date.........., 190..

Name ....

Address ....

Name of dairy ....

Number of cows owned.......................

Names and addresses of persons from whom milk is purchased.

....

....

....

....

....

....

Amount purchased daily ....gallons

Amount sold daily.................gallons

For the year ending April 30, 190..

DAIRYMEN'S PERMIT.

OFFICE OF THE BOARD OF HEALTH OF THE CITY OF LOS ANGELES, STATE OF CALIFORNIA,

Los Angeles, Cal.,............*190*..

Permit No. ......

This certifies that ...... owner agent of ...... dairy, located at ...... has permission to sell milk in the city of Los Angeles for the year ending April 30, 190.., unless this permit shall be sooner suspended.

By order of the board of health.

......, *Health Officer.*

It is understood and agreed by the holder hereof that this permit is granted and accepted upon the express condition that it shall be subject to suspension for a period not exceeding six months by the said board of health, in its discretion, upon proof to the satisfaction of said board of a violation by the holder hereof, his servant or agent, of any of the provisions of ordinance No. ...... (new series), or upon proof of violation by said holder of any law of this State providing against the adulteration of milk or cream.

....

Form for license to sell milk, receipt for same, and stub for same, Boston, Mass.

No. ....
Date......................, 189..
Proprietor..............................
Place of business.........................
Number of carriages.......................
Names of drivers..........................
....
....
....
Section supplied ....
No. of cans sold..........................
No. of cans raised ....
No. of cows kept..........................

POST THIS IN A CONSPICUOUS PLACE.

CITY OF BOSTON.

BUREAU OF MILK INSPECTION,
994 WASHINGTON STREET.
LICENSE TO SELL MILK NO. ....

This certifies that ...... of ...... is licensed to sell milk in the city of Boston during the year ending May 31, 1900.

......, *Inspector of Milk.*

License issued ...... 1899.

NOTICE.—The licensee's name, place of business, and license number must be placed on each outer side of all vehicles used in the conveyance and sale of milk.

All changes of residence and of drivers must be immediately reported to the inspector.

Penalty for neglect of these provisions, not less than thirty dollars.

....

BOSTON, ... 1899.

Received of ...... inspector of milk, License (No. ...), to sell milk in the city of Boston for the year ending May 31, 1900.

....

Witness to signature ......

Form for notice to milk dealer to display license number on delivery wagons.—Minneapolis, Minn.

(ORIGINAL.)

MINNEAPOLIS, MINN., ..., 190...

Mr. ......

You are hereby notified that the law requires your name and location of dairy, with number of your city license, upon each vehicle used by you in selling milk.

Ten days' notice is hereby given you to comply with the law.

......, *Commissioner of Health.*

......, *Inspector.*

Forms for recording data regarding milk samples in Minnesota.

[Front.]

STATE DAIRY AND FOOD COMMISSION.

MILK FROM WAGON.

Date, ..., 189...

Time......a. m. ......p. m.

Name on wagon......

....

Driver in charge......

Locality......

Whether marked skimmed milk......

No. of cans on wagon......

Samples taken from......qt. can.

License No. ......

No. on sample......

BABCOCK TEST.

Temp. ......

Specific gravity......

Fat......

Sample delivered chemist......189...

......, *Inspector.*

[Back.]

ANALYSIS.

Analysis No. ......

Specific gravity......

Milk solids......

Not fat......

Fat......

Ash......

Milk sugar......

Casein, etc. ......

Water......

Water added......

Color......

REMARKS.

....

....

....

....

....

Class......

......, *Chemist.*

NOTE.—White cards are used for samples collected from wagons and yellow cards for samples collected from stores.

Form for recording data regarding milk samples.—Worcester, Mass.

[This is printed on the two sides of a tag, to be attached to the sample bottle.]

CITY OF WORCESTER.

MILK.

Agent......
Date......
Time......a. m......p. m.
Town or city......
Street......

Wagon.
Name on wagon......
License No. ......
Driver in charge......
No. cans......

Store.
Proprietor of store or restaurant......
....
Of whom obtained......
Time of delivery at store......
Price sold at......

Sample taken from......quart can......
......marked "skimmed milk."
Other marks ....
....
Duplicate sample sealed and delivered to
....
Receipt taken ....
....
Remarks.................................
....
....
....

CITY OF WORCESTER. MILK INSPECTOR'S DEPARTMENT, ROOM 2, CITY HALL.

Result of analysis:
Solids not fat......
Fat......
Total solids......
Water......
Color......
Specific gravity......
Cream by volume......
Remarks.................................
....
....
Notified by postal of result of test.

Form for recording data regarding milk samples.—Newark, N. J.

[An exact duplicate of this form is attached to it, one copy to be given to the person from whom the sample is taken, the other to be retained by the officer.]

Original.

BOARD OF HEALTH, NEWARK, N. J.

......, 189...

Milk sample No. ......
Taken at......
Date of taking sample......, 189...
Owner......
Occupation......
Address......
Witness......
Occupation......
Address......
Person sample taken from......
Occupation......
Address......

LACTOMETER TEST.

Lactometer reading...Temp. reading...
Corrected reading......
Sample delivered to......
Chemist of the board of health on..189...
Remarks..............................
....
....
....
......, *Inspector.*

Form for recording data regarding preliminary inspections of milk, Philadelphia, Pa.

Date, ... Hour, ...
Street and number, ...
Name of owner, ...
Business, ...
From whom purchased, ...
P. O. address, ...

Can No.	Amount of contents.	Lactometer.	Temperature.	Lactometer at 60°.	Whole milk.	Skimmed milk.
1						
2						
3						
4						

No. of inspection ......
Mark .. on can, ...

REMARKS:

....
....
....

Form for recording data regarding preliminary inspections of milk, Baltimore, Md.

HEALTH DEPARTMENT. INSPECTION OF MILK
AT RAILROAD STATIONS.

Station..... Date...... Inspector......
No. of galls.... Whole M.... Skim M....
Cream......
In can }......
Marked }......
Lact. reads...... at ......°F. Action......

Form for notification of the taking of a sample, Newark, N. J.

DEPARTMENT OF PUBLIC HEALTH, *Newark, N. J.*, ...

To......

DEAR SIR: I have taken a sample of milk for analysis from your store, ... street, on this ...... day of ......, and divided said sample into two parts, and placed each part in a suitable vessel, duly sealed and delivered, tendered at the time of such taking one part to you, ..., and in pursuance of the statute in such case made and provided (being the act of April 14, 1891). I deliver to you this statement in writing, and state that the cause of said sample having been taken is that the said milk contains more than eighty-eight (88) per centum of watery fluids and less than twelve (12) per centum of milk solids.

....
Milk Inspector.

Form for reporting analyses of milk samples, Worcester, Mass.

[Printed on postal cards.]

CITY OF WORCESTER, DEPARTMENT OF MILK INSPECTION, ROOM 2, CITY HALL.

As per the provisions of chapter 169, acts of 1899, we notify you that the samples taken from ...... have shown the following:

Fat, ...
Solids, ...
Cream by volume, ...
Specific gravity, ...

....
Milk Inspector.

Form to be attached to a can from which milk has been spilled, Baltimore, Md.

BY DIRECTION OF THE HEALTH DEPARTMENT OF BALTIMORE CITY.

The contents of this can have been examined and found not to accord with requirements of ordinance No. 87, approved May 16, 1894, and have therefore been destroyed under the provision of ordinance No. 130, approved July 9, 1894.

Gallons spilled ...... at ...... station. Date, ... by ......, *Inspector.*

Form for notice of condemnation of milk and stub for same, Philadelphia, Pa.

[Stub for blank below.]

BOARD OF HEALTH, OFFICE OF CHIEF INSPECTOR OF MILK. CITY HALL, ROOM 513.

Philadelphia, ..., *190*...

No. ......

...... quarts (gallons......) of milk condemned in the possession or custody of

....

Residence, ...

Sample delivered to......

......, *Chief Inspector of Milk.*

per ......, *Asst. Inspector.*

BOARD OF HEALTH. OFFICE OF CHIEF INSPECTOR OF MILK. CITY HALL, ROOM 513.

Philadelphia, ..., *190*...

No. ......

I hereby certify that I have this day inspected and condemned ...... quarts (gallons ......) of milk, in the possession or custody of ......, place of business, ..., and taken samples of same for examination and proof, one of which I have returned to said ......, as required by ordinance.

......, *Chief Inspector of Milk.*

per ......, *Asst. Inspector.*

Form for recording inspection of milk depots, New Jersey.

BOARD OF HEALTH OF THE STATE OF NEW JERSEY. RECORD OF INSPECTION OF MILK DEPOT.

1. [Date of inspection.]...... 2. [Name of place.]...... 3. [Name of dealer.] ...... 4. [Street and number.]...... 5. How is the milk stored?...... 6. How are cans, bottles, and utensils washed?...... 7. Any appliances for sterilizing cans, bottles, and utensils?...... 8. Quantity of milk sold daily...... 9. Is can kept covered?...... 10. How is milk cooled?...... 11. Temperature of milk when sold...... 12. Where is the regular supply of milk obtained?...... 13. When short, where is the supply obtained?...... 14. How many persons handle the milk?...... 15. Are all in good health?...... 16. Date of last sickness on premises...... 17. Name of disease...... 18. Source of ice supply...... 19. Source of water supply...... 20. Was sample taken for analysis?...... 21. Marks...... 22. ......

......, *Signature of Inspector.*

Form for recording inspection of stores, etc., Fall River, Mass.

OFFICE OF THE BOARD OF HEALTH, FALL RIVER, MASS.

INSPECTION OF STORES, BOOTHS, STANDS, ETC.

Where milk is received, held, kept, bottled, canned, stored, or offered for sale by Mr. ......, of ...... (Made in accordance with the demands of an ordinance entitled, "Relating to the sale of milk in the city of Fall River, Mass., and regulation No. 71 of the board of health of said Fall River.") Location of store, booth, or stand?

...... Description of store, booth, or stand? ...... Description of bottling or canning room? ...... Is license to sell milk conspicuously posted? ...... Approximate quantity of milk sold daily? ...... Provision for keeping the milk from contamination? ...... Condition of receptacle in which milk vessels and measures are kept? ...... Condition of milk cans and other vessels used? ...... Condition of measures used? ...... General sanitary condition of store? ...... Sanitary condition of surroundings? ......

SOURCE OF MILK SUPPLY.

Name.	Address.
....	....
....	....
....	....

NAME AND ADDRESS OF PERSONS TO WHOM MILK IS DELIVERED TO BE RESOLD.

....	....
....	....
....	....

Inspected, ..., 18...

......, *Inspector of Milk, for Board of Health.*

Form for record of inspections of wagons, etc., Fall River, Mass.

OFFICE OF THE BOARD OF HEALTH, FALL RIVER, MASS.

INSPECTION OF WAGONS, VEHICLES, ETC.,

Used to convey milk, or from which milk is sold or delivered by Mr. ......, of ...... (Made in accordance with the demands of an ordinance entitled, "Relating to the sale of milk in the city of Fall River, Mass., and regulation No. 71 of the board of health of said city.") Number of license? ...... Is name of licensee and number of license painted on wagon according to regulation 71? ...... Is license carried on the wagon? ...... Name and address of driver of wagon at time of inspection? ...... Approximate quantity of milk sold or delivered daily? ...... How much, if any, is sold to dealers to be resold? ...... Provision for keeping the milk from contamination? ...... Condition of receptacle in which milk vessels and measures are kept? ...... Condition of milk cans and other vessels used to hold milk? ...... Condition of milk measures and other utensils? ......

SOURCE OF MILK SUPPLY.

Name.	Address.
....	....
....	....
....	....

NAME AND ADDRESS OF PERSONS TO WHOM MILK IS DELIVERED TO BE RESOLD.

....	....
....	....
....	....

Inspected ......, 18...

......, *Inspector of Milk, for Board of Health.*

Forms for prohibiting and permitting the use of bottles, Yonkers, N. Y.

Office of the Board of Health,
Yonkers, N. Y., ..., 189..

Mr. ....

Dear Sir: You are hereby notified that there is a case of ...... in the family of ......, ... street, and that, in pursuance of article 14, section 30, of the sanitary code, you will be required to discontinue the furnishing of receptacles for the delivery of milk into said family until you shall have been notified by this board that the danger from contagion is passed.

Respectfully,

......, M. D., *President.*

......, *Milk Inspector.*

Office of the Board of Health,
Yonkers, N. Y., ..., 189..

Mr. ....

Dear Sir: Permission is hereby given for the delivery of milk into the family of ......, ... street, in dealers' receptacles, as the danger from contagion on these premises has passed.

Respectfully,

......, M. D., *President.*

......, *Milk Inspector.*

Form for notification of violation of the law, Washington, D. C.

Any objection to this notice should be filed with the health officer before the expiration of the time allowed for making the changes specified.

No. ......

Health Department, District of Columbia,
Dairy and Dairy Farm Inspection.

Washington, ...189..

Mr. ......

Sir: Your attention is called to the following violations of the regulations for the government of dairies and dairy farms, which have been found to exist upon your premises:

....

....

....

You are hereby notified to correct the same within ...... days from the date of service of this notice.

By order of the health officer.

....,
Inspector of Dairies and Dairy Farms.

Form for warning against the sale of adulterated milk, Holyoke, Mass.

City of Holyoke,
Office of Inspector of Milk, Corner of Main and Mosher Streets,
Holyoke, ..., 190—.

No. ......

You are hereby notified that a sample of ...... marked ......, recently obtained from you was found on analysis to be adulterated. You are respectfully warned that the obtaining of another such sample will be followed by prosecution according to law.

Respectfully, yours,

.................., *Inspector.*

Forms for keeping the records of the milk inspector's office by the "card system," Providence, R. I.

Time, ... Date, ...

MILK FROM STORE.

Proprietor's name ....
No. .... street.
Milkman .... Sample from ....
Clerk .... No. on sample can ....
Can marked skimmed milk .... Seal ....
Sample sealed and delivered to .... Whether measure marked ....
Collector .... Whether at all frozen ....
Remarks ....
....

Name, ... Date, ...
Address .... Anal. No. ....
Milkman .... Taken from ....
Sp. gr .... Milk sugar ....
Fat .... Casein ....
Total .... Acidity ....
S. N. F .... Color, etc ....
Ash ....
Remarks ....
....

No. ...... Name ....
Place of business ....
Store .... Bakery .... Restaurant .... Lunch cart ....
Milkmen ....
....
Quantity week day ...... Sunday ...... Time delivered ....
Whether cream is sold ...... Whether skimmed milk is sold ....

The undersigned hereby makes application that his name be recorded in the inspector of milk's book as a milk dealer in the city of Providence, for the year ending February 1, 1901.

Signed ....
By ....

O

[Continued from 2d page of cover.]

Dr. J. S. Kelly, care Blomer & Michael Co., Quincy, Ill.
Dr. F. D. Ketchum, South St. Paul, Minn.
Dr. W. B. Lincoln, Union Stock Yards, Nashville, Tenn.
Dr. C. Loveberry, care Frye-Bruhn Co., Seattle, Wash.
Dr. H. D. Mayne, Malone, N. Y.
Dr. J. Miller, care John Morrell & Co., Ottumwa, Iowa.
Dr. J. C. Milnes, care John Cudahy Co., Wichita, Kans.
Dr. C. L. Morin, St. Albans, Vt.
Dr. A. R. Morse, care the Agar Packing Co., Des Moines, Iowa.
Dr. W. J. Murphy, care Springfield Provision Co., Brightwood, Mass.
Dr. W. N. Neil, care The Rath Packing Co., Waterloo, Iowa.
Dr. A. J. Payne, care Union Stock Yards, Cincinnati, Ohio.
Dr. F. M. Perry, Fort Fairfield, Me.
Dr. A. J. Pistor, care New York Hotel, Fremont, Nebr.
Dr. G. W. Pope, Animal Quarantine Station, Athenia, N. J.
Dr. H. T. Potter, Calais, Me.
Dr. A. G. G. Richardson, care Armour Station, Kansas City, Kans.
Dr. W. H. Rose, 18 Broadway, New York, N. Y.
Dr. F. L. Russell, Orono, Me.
Dr. J. F. Rider, care U. S. consul, Liverpool, England.
Dr. E. P. Schaffter, care Cleveland Provision Co., Cleveland, Ohio.
Dr. C. A. Schaufler, 134 South Second st., Philadelphia, Pa.
Dr. T. A. Shipley, care T. M. Sinclair & Co., Ltd., Cedar Rapids, Iowa.
Dr. N. C. Sorenson, care Kingan & Co. Indianapolis, Ind.
Dr. R. P. Steddom, room 16, Deaderick Building, Knoxville, Tenn.
Dr. William Thompson, Exchange Building, Sioux City, Iowa.
Dr. T. J. Turner, 507 Johnson st., Louisville, Ky.
Dr. E. L. Volgenau, Live Stock Exchange Building, East Buffalo, N. Y.
Mr. Wm. H. Wade, Animal Quarantine Station, Halethorp, Md.
Dr. H. N. Waller, 109 West 42d st., New York, N. Y.
Dr. G. W. Ward, Newport, Vt.
Dr. B. P. Wende, Live Stock Exchange Building, East Buffalo, N. Y.
Dr. W. H. Wray, 21 Railway Approach, London Bridge S. E., London, England.
Dr. C. H. Zink, care Western Packing Co., Denver, Colo.

DAIRY INSPECTORS.

W. D. Collyer, 210 South Water st., Chicago, Ill.
James Hewes, 2110 North Charles st., Baltimore, Md.
M. W. Lang, Department of Agriculture, Washington, D. C.
E. A. McDonald, 58 and 59 Downs Block, Seattle, Wash.
Wm. E. Smith, 168 Chambers st., New York, N. Y.
B. F. Van Valkenburgh, 168 Chambers st., New York, N. Y.
E. H. Webster (in the field, or), Manhattan, Kans.
Levi Wells (Bradford County), Spring Hill, Pa.
G. M. Whitaker, P. O. box 1332, Boston, Mass.
W. H. Saylor, 114 California st., San Francisco, Cal.